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Division of Agricultural Sciences
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URBANIZATION AND ITS EFFECTS ON AGRICULTURE IN SACRAMENTO COUNTY, CALIFORNIA

1. Urban Growth and Agricultural Land Use

Curtis C. Harris, Jr., and David J. Allee

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FOREWORD

Urban growth has far-reaching effects on agriculture. This is especially true in California where prime agricultural land is in the direct path of rapidly growing urban areas. This paper is the first part of a two-part report on urbanization and its effects on agriculture in Sacramento County, California. This part describes the urban growth and relates it to agricultural land use. The second part will analyze the effects of urbanization on prices and taxes of agricultural land.

The authors wish to express their appreciation for the excellent cooperation and aid received from many individuals. Much of the information on the urbanization of Sacramento County was supplied by personnel of the Office of the Planning Commission, County of Sacramento. Thanks go to Earl D. Fraser, Planning Director, Nadya O. Andrews, Principal Planner, and Robert J. Webster, Planning Technician of the Advance Planning Section. Mr. Fraser and Mrs. Andrews read and commented on the first draft of the report. Their comments greatly improved the final outcome.

The information on agricultural land use was supplied largely by the farm advisors, Sacramento County, Agricultural Extension Service, University of California. The farm advisors and their specialty, at the time the information was obtained, were: James Elings (Director), livestock; Glenn Goble, dairy and irrigated forages; Thomas Kearney, hops and cereal crops; Torrey Lyons, field and vegetable crops; Woodrow Mitchell, poultry; and Gordon Morehead, horticulture. Thanks also go to A. Doyle Reed, Agricultural Extension Service, University of California, Davis, for many helpful comments and suggestions.

Although this report has benefited from the aid and suggestions of the above named individuals, and many other people, the authors assume full responsibility for the results.

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URBANIZATION AND ITS EFFECTS ON AGRICULTURE IN SACRAMENTO COUNTY, CALIFORNIA

1. Urban Growth and Agricultural Land Use

by

Curtis C. Harris, Jr.[1] and David J. Allee[2]

INTRODUCTION

The total population of Sacramento County almost doubled between 1950 and 1960, while the urban population more than doubled. The additional urban population settled in the rural-urban fringe area around the City of Sacramento with very low density rates, making the land area of the Sacramento urbanized area in 1960 more than three times the size in 1950. Population projections indicate that substantial amounts of land will be needed for future urban use.

This urban growth already has had noticeable effects on agriculture in the county. Past growth has taken some land out of agricultural use and has affected agricultural practices on other land. Potential growth has affected the intensity of farming, the value of land, and the tax burdens of the farmers.

The first section of this paper is concerned with the urbanization of Sacramento County. The urban growth from 1950-60 is described, population and land use projections are made, and the direction and time sequence of urban growth by subareas within the county are analyzed.

The second section of the paper is concerned with agricultural land use. Changes in land use are described by major commodities, by subareas within the county, and by distance from the City of Sacramento. Recent and projected changes are related to urban growth. The effects of urban growth on the intensity of land use are analyzed, and the changes in Sacramento County are compared with other counties.

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URBAN GROWTH

Urban Growth, 1950 to 1960

Population and Employment

Sacramento County is one of the fastest growing counties in California. In the decade of the forties, population grew 62.7 percent; in the fifties it grew 81.4 percent. High rates of growth also are predicted for the immediate future.

Table 1 contains selected population and employment data for Sacramento County for 1950 and 1960. Most of the population increase was urban population; what increase there was in rural population was not farm population. The farm population declined 51.3 percent, and in 1960 it was only 1.6 percent of the total population.

The employment data show the same trends--increases in urban employment and decreases in agricultural employment. The number of farm workers, however, did not decline as much as total farm population. This indicates that a greater percentage of agricultural workers (and farmers) lived in urban places in 1960 than in 1950. The number of workers in the processing phase of agriculture also declined during the decade.

The largest percentage increase in employment came in the manufacturing sector. This was due, in large part, to the establishment of a large aerospace industry in the county. Another notable increase was in the field of services, which includes business, repair, personal, entertainment and recreation, educational, professional, financial, insurance, and real estate.

Table 1 also contains some comparable figures for the ten Standard Metropolitan Statistical Areas (SMSA) in California.[1/] A comparison with the appropriate data for Sacramento County, which is an SMSA, reveals the similarities and differences between the changes in Sacramento and the average of all urban counties.

1/ A Standard Metropolitan Statistical Area (SMSA) is, among other things, a county or group of contiguous counties, which contains at least one city of 50,000 inhabitants or more. See the U.S. Bureau of the Census, U.S. Census of Population, 1960, for a more complete definition.

TABLE 1

Population and Employment Data for Sacramento County, the Standard Metropolitan Statistical Areas in California, and the State of California, 1950-60

	Sacramento County					SMSA's in California a/			State of California		
	Numbers		Percent of total		Percent	Percent of total		Percent	Percent of total		Percent
	1950	1960	1950	1960	change	1950 b/	1960	change	1950	1960	change
Total Population	277,140	502,778	100.0	100.0	81.4	100.0	100.0	51.2	100.0	100.0	48.5
Urban population	207,230	426,531	74.8	84.8	105.8	73.2	92.4	90.9	80.7	86.4	58.9
In urbanized area c/	202,731	415,177	--	--	--	--	--	--	--	--	--
Rural population	69,910	76,247	25.2	15.2	9.1	26.8	7.6	- 57.2	19.3	13.6	4.8
Rural farm population	16,351	7,962	5.9	1.6	- 51.3	3.2	1.1	- 50.5	5.4	2.1	- 41.2
Total Workers	106,147	184,009	100.0	100.0	73.4	100.0	100.0	50.6	100.0	100.0	47.6
Agriculture	6,901	5,558	6.5	3.0	- 19.5	4.8	2.9	- 9.3	7.3	4.5	- 9.7
Self-employed	2,886	1,949	--	--	- 32.5	--	--	--	--	--	- 22.4
Construction	9,205	15,933	8.7	8.7	73.1	7.6	6.2	21.8	7.7	6.3	21.1
Manufacturing	10,434	30,174	9.8	16.4	189.2	20.7	25.5	85.7	19.6	24.1	82.2
Food and kindred products	7,619	7,365	--	--	- 3.3	--	--	40.7	--	--	42.0
Transportation, communication, and utilities	11,565	13,545	10.9	7.4	17.1	8.3	6.9	24.7	8.2	6.8	23.5
Public administration	21,180	34,979	20.0	19.0	65.2	6.6	6.2	41.4	6.3	6.1	43.8
Services	17,670	45,389	16.6	24.7	156.9	27.2	28.4	57.1	26.3	28.1	57.3
Wholesale and retail trade	23,244	32,426	21.9	17.6	39.5	22.8	18.7	23.9	22.4	18.8	24.0
Other	5,948	6,005	5.6	3.2	1.0	2.0	5.2	290.2	2.2	5.3	245.4

a/ The 10 SMSA's along with their counties are: Bakersfield (Kern County), Fresno (Fresno County), Los Angeles-Long Beach (Los Angeles and Orange Counties), Sacramento (Sacramento County), San Bernardino-Riverside-Ontario (Riverside and San Bernardino Counties), San Diego (San Diego County), San Francisco-Oakland (Alameda, Contra Costa, Marin, San Francisco, San Mateo, and Solano Counties), San Jose (Santa Clara County), Santa Barbara (Santa Barbara County), and Stockton (San Joaquin County).

b/ Bakersfield and Santa Barbara were not Standard Metropolitan Areas in 1950, although these data are included here for comparison purposes.

c/ Excludes population of Sacramento urbanized area outside of Sacramento County.

Source: U.S. Bureau of the Census, U.S. Census of Population. 1950 and 1960, California, various tables.

Notable differences are that Sacramento County's total urban population grew faster than the urban population in the SMSA's, and that the rural population increased in Sacramento but decreased in other urban counties. The latter does not mean that the farm population change was different--both in Sacramento and in the composite SMSA's the decrease in farm population was over 50 percent.

Sacramento County had a much larger percent increase in total manufacturing workers than did the SMSA's. However, it had a decrease in workers engaged in the manufacture of food products, whereas the average SMSA showed an increase.

Data for the entire State of California (Table 1) follow closely the changes in the SMSA's, with the exception of the change in rural population. 1/

The Sacramento Urbanized Area

In addition to being an SMSA, Sacramento County contains part of an urbanized area as defined by the census.2/ The change in size of this area between 1950 and 1960 reveals the change in land use during the fifties (Figure 1). Large nonfarm areas of land excluded from the urbanized area include the cities of Galt, Elk Grove, and Folsom, Mather Air Force Base and Aerojet General Corporation.

The population of the Sacramento urbanized area increased 113.4 percent between 1950 and 1960 (Table 2), while the area increased 221.7 percent. This indicates that the additional area had a much lower population density than existed in the urbanized area in 1950. Overall, population density decreased 34.7 percent to 3,373 people per square mile.

Considerable decrease in population density occurred within the city limits of Sacramento itself. The city annexed 28.2 square miles during the

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1/ For additional data on population and employment in Sacramento County with comparisons to the United States see Tsagris, B. E., and Robert K. Coe, Changing Pattern of Industrialization, Land Use, and Values: Sacramento Metropolitan Area, 1950-61, State of California, Division of Real Estate, June 1962, Chapter 2.

2/ An urbanized area contains at least one city of 50,000 inhabitants as well as closely settled incorporated places and unincorporated areas, which can be in other counties. For a more detailed definition see U.S. Bureau of the Census, U.S. Census of Population, 1960. The Sacramento Urbanized area included a part of Yolo County in 1950 and parts of Yolo and Placer Counties in 1960.

FIGURE 1

The Sacramento Urbanized Area, 1950 and 1960 and Other Major Urban Areas, 1960

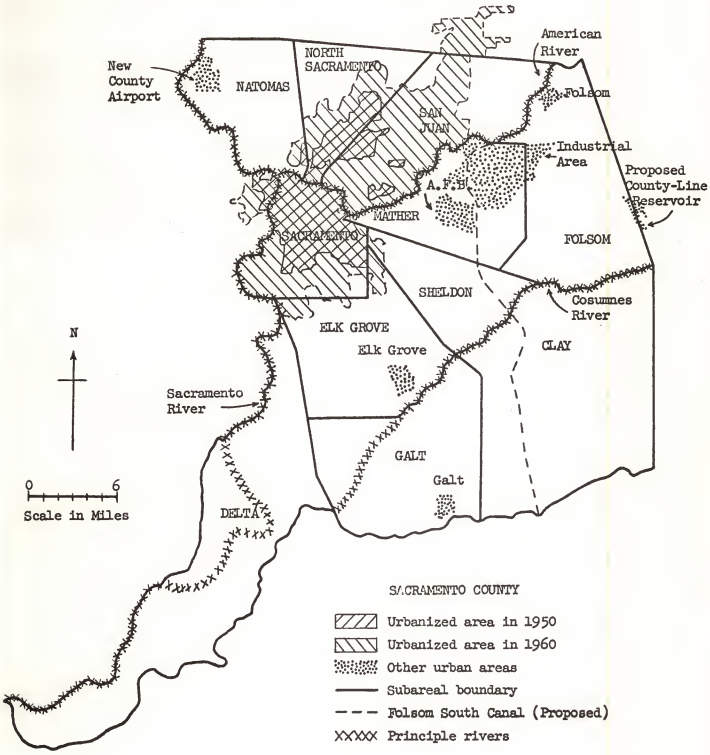

TABLE 2

Population and Land Area of the Sacramento Urbanized Area, 1950 and 1960

	Population		Land area in square miles	Population per square mile
	Number	Percent distribution		
1950				
Total	211,777	100.0	41.6	5,091
Sacramento City	137,572	65.0	16.9	8,140
Urban Fringe	74,205	35.0	24.7	3,004
1960				
Total	451,920	100.0	134.0	3,373
Sacramento City	191,667	42.4	45.1	4,250
Urban Fringe	260,253	57.6	88.9	2,927
Percent change 1950-60				
Total	113.4	--	221.1	- 33.7
Sacramento City	39.3	--	166.9	- 47.8
Urban Fringe	250.7	--	259.9	- 2.6

Source: U.S. Bureau of the Census, U.S. Census of Population, 1960, Number of Inhabitants, U.S. Summary, Final Report PC(1)-1A - Table 22.

fifties, and much of this area still contained farm land in 1960. Also urban renewal projects decreased densities in some downtown census tracts.

The fringe area (area not within the city limits) increased in area and population by greater percentages than did the urbanized area as a whole--259.9 and 250.7 percent, respectively. The increase in the fringe is even more pronounced if the annexation effects are eliminated. The urban area outside of the 1950 city limits had increased almost fourfold by 1960.

Subdivisions

Subdivisions largely determine the amount of land that will be converted to all types of urban use and the amount of land that, while not converted, is idled or otherwise affected. It is the pattern of subdivision development that primarily determines the impact of urban growth on agriculture.

The data in Table 3 give a partial indication of the importance of subdivisions. Subdivisions in incorporated areas are not included and much of the resulting public and commercial uses are not indicated. These data show that some 20,000 acres (comprising about 60,000 lots) were involved from 1950-60 in over 1,000 subdivisions. This is roughly one new subdivision lot outside a city for every 3.6 people added to the total county population. The latter number closely approximates the size of the average family. Most of the subdivisions were located in the San Juan subarea (Figure 1).

Potential Urban Growth

Population Projections

Officials of Sacramento County have projected the population growth to the year 2000.[1/] The estimates are based on population projections made by the Bureau of the Census. The United States and Western States projections were converted into projections for California, which in turn were converted into projections for the group of 28 counties within 100 miles of Sacramento. Ultimately, projections of Sacramento County were derived (Table 4). Population is expected to reach 2,440,000 by the year 2000.

1/ "Sacramento County Population Study," Data Sheets Nos. 1 and 2, prepared by the Staff of the Planning Department.

TABLE 3

Subdivision Activity in the Unincorporated Areas of Sacramento County, 1950-60

Year beginning July	Subdivision maps recorded	Total lots for all subdivisions	Average lots per subdivision	Average lots per acre
1950 a/	64	N.A. b/	N.A.	N.A.
1951 a/	57	N.A.	N.A.	N.A.
1952 a/	37	N.A.	N.A.	N.A.
1953 a/	67	N.A.	N.A.	N.A.
1954	120	6,586	54.9	3.7
1955	106	6,356	59.0	3.3
1956	65	2,813	43.2	2.6
1957	80	3,419	42.7	2.9
1958	159	8,255	51.9	3.6
1959	173	8,928	51.6	3.6
1960	134	4,722	35.2	3.3

a/ Calendar years. Data from The Daily Recorder, Sacramento, California, January 11, 1961.

b/ N.A. = not available.

Source: (Except as noted in a/) Annual Report, 1956-57, and Progress Report, 1957-61, Sacramento County Planning Commission, Sacramento, California.

TABLE 4

Population Projections for Sacramento County

Year	Population	Percent increase
1970	830,000	65
1980	1,260,000	53
1990	1,800,000	43
2000	2,440,000	35
Holding capacity:	5,513,000	--

Source: "Sacramento County Population Study" Data Sheet No. 2.

The concept of "holding capacity" is useful in studying population growth in a rapidly growing area. "Holding capacity" refers to the population that would reside in an area given the expected (or assumed) population density and the expected (or assumed) amount of land that will be used for residential purposes. It does not refer to a physical limit in the number of persons that can reside in an area. No area is ever "completely" developed and growth may continue even after the area has reached its holding capacity.

In the "Sacramento County Population Study," Data Sheet No. 2, the holding capacity for the county is estimated at 5,513,000.[1/] This was based on expectations that the potential residential area is 685.5 square miles and the density will average about 8,000 persons per square mile.[2/] Land excluded from potential residential use includes major industrial, large park, large commercial, exclusive agriculture, and flood plain areas. The average density is in terms of gross land use; that is, it is a density that would apply to land used for residential purposes, including land for streets, schools, neighborhood parks, and normal commercial areas.

The 1960 trend in density was about 6,500 persons per square mile. If this rate continues, the holding capacity would be closer to 4.5 million. The 1960 density figure was estimated from assumed densities by subareas based on the current densities of subdivisions in the subareas. Generally, the closer to the City of Sacramento, the higher the density.

Land-Use Projections

The expected density of an area when all the land is developed for urban use is not the density of the area while it is growing. There is always some sprawl, i.e., land withdrawn for urban use, but not developed. In the Sacramento urbanized area, as defined by the census, the population density in 1960 was 3,373, yet the same land area is expected to hold more than 7,000 persons per square mile. More land is expected to become part of the urbanized area before the present area reaches the latter figure. In fact, sprawl in additional land area might lower the overall density, as happened between 1950 and 1960. The average density for the 1950 urbanized area was 5,091.

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1/ This excludes the Courtland and Rio Vista school districts. These areas are expected to remain primarily rural.

2/ Densities were estimated by school districts; 8,000 is approximately the weighted average.

Sprawl in other urbanized areas between 1950 and 1960 was similar to that in the Sacramento urbanized area. In 1960 the average density for all of the 213 urbanized areas in the United States was 3,752 persons per square mile. In 1950 it was 5,408, within 157 areas. In 1960 the average density of 19 urbanized areas having a population within 50,000 of the Sacramento area was 2,834; in 1950 it was 4,199. Compared with other urbanized areas in California, Sacramento's density was higher than five areas and lower than five areas in 1960.

As in the past, urban land use in the future will depend on the degree of sprawl. Table 5 compares land needed for the whole county's population under two sets of conditions: (1) with no sprawl and (2) with sprawl continuing at the 1960 rate. The amount of land withdrawn for urban purposes in 1960 was about twice the amount actually developed. The 1960 land withdrawn for urban use is about the amount of land that would be required in 1975 without sprawl. This means that the estimated additional population between 1960 and 1975 could be settled without any additional land withdrawn from agriculture.

The estimated requirement for land in the year 2000 under the 1960 degree of sprawl is greater than the amount of land expected to be used for residential development. This means that the whole county would be urbanized by 2000, except in the areas, such as the Delta, that are expected to remain in agricultural use. But there would still be land available for about twice the projected population for the year 2000.

The possible paths of land use as population grows can be seen in Figure 2. In 1960 Sacramento County was at point A, with about 500,000 people and 155 square miles of land in urban use. The projected end point is A', where all of the expected residential land is fully used, resulting in a population of 4.5 million and a density of 6,500.

One possible route to A', though not a probable one, is ABA'. On this route the urban area would be held constant to about 1975, after which the area would grow with population at a density rate of 6,500. Another route is ACA', which means sprawl at the 1960 rate until about 1995--the time when all of the land would be withdrawn for urban use, though not all actually developed--after which the density would become higher as the population grew to

TABLE 5

Estimated Land Requirements for Population in Sacramento County, without Urban Sprawl and with Sprawl at 1960 Rate

Year	Urban Land Requirements a/	
	Without sprawl b/	With sprawl at 1960 rate c/
	square miles	
1960	77	155
1970	128	255
1980	194	388
1990	277	554
2000	375	751

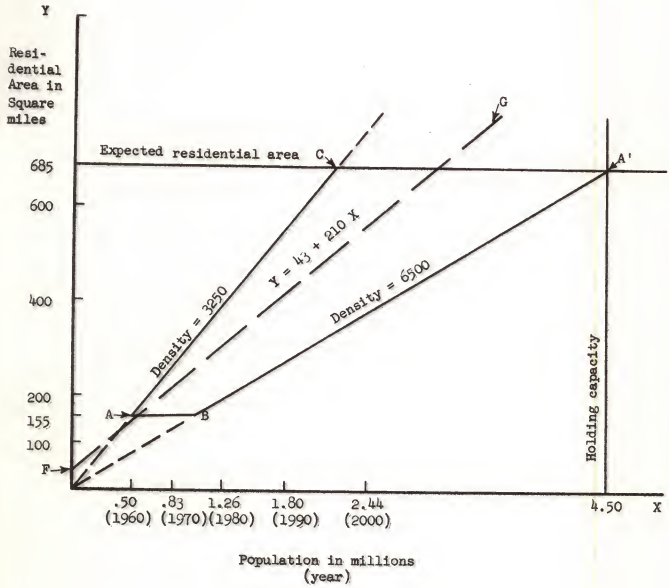
a/ Excludes land needed for large industrial and commercial areas, large parks, exclusive agriculture, and flood control.

b/ Assumes population (given in Table 4) settled at 6,500 persons per square mile on the average.

c/ Assumes population settled at 3,250 persons per square mile on the average.

FIGURE 2

Possible Routes to Expected Urban Settlement
of Sacramento County



its maximum. The route to A' is likely to be one with the density declining, perhaps approaching the CA' line asymptotically.

A comparison of the above routes from A to A' and all other possible routes can be made with the average relation that exists among all of the urbanized areas in California. This relationship is shown in Figure 2 as the line FG. It is the linear regression equation $Y = 43 + 210X$ ($r^2 = .99$), where Y = square miles and X = millions of persons. The observations are the population and area data for the 11 California urbanized areas.1/ The linear relationship exists because the land area of urbanized areas expands as population increases. If land area were to remain constant then a logarithmic relationship would be expected.

Since this regression line intersects the Y axis, the population density increases as the population increases. When population is 1 million the density is 3,953; at 2 million it is 4,320; and at 3 million it is 4,458. Each additional 1 million people is settled at a density rate of 4,763. This relationship between density and population is similar to that found by Clawson, Held, and Stoddard for all of the urbanized areas in 1950.2/

The Direction and Time Sequence of Urban Growth

A Concept of Access

The location of new urban activity around an existing urban center depends on a complex of factors. The location of residential development depends on school availability and quality, convenience of shopping, employment availability, commuting time and convenience, taxes, utility rates, construction costs, and a host of other tangible and intangible public and private considerations. A similar list could be constructed for the location of commercial and industrial activity. These locational advantages can be

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1/ Observations of urbanized areas outside California were not included since there are definite differences in living habits in other parts of the country. The data for urbanized areas do not represent all of the urban area and population of a county, as given for Sacramento County, since these additional data are not readily available. However, they do include the major proportion of the urban data.

2/ Clawson, Marion, R. Burnell Held, and Charles H. Stoddard, Land for the Future, Resources for the Future, Inc., Washington, D.C., 1960, pp. 82-84. Population density was related with the logarithmic value of population.

summarized in the word "access."[1] The greater the benefits of locating on a particular site[2] or in a given area, the greater its access; thus the greater the chance of the site or area being developed for urban purposes. Anything that would increase the access of a given area, such as a new freeway, would increase the probability of the area becoming developed in a given time period.

In projecting the direction of urban growth into subareas around the urban center, four interrelated access characteristics are hypothesized as being important. These are: (1) employment opportunities, (2) the population-business complex of the subareas in relation to the urban center, (3) freeway development and commuting time, and (4) public utility development, particularly sewer systems.

Employment opportunities.--Proximity to the job is a major influence determining where individuals reside.[3] If all employment opportunities are in the central city, then residential development is likely to be distributed in all directions from the city, provided, of course, that time and ease of commuting is equal from all directions. If a large firm or industry is located outside the central city in one direction, then residential development will tend to be concentrated in that direction.

In Sacramento County the principal nonfarm employment opportunities are (1) in or adjacent to Sacramento City, with major employer groups being governments, agricultural processing firms, railroads, retail and wholesale trade establishments, and other firms that service the activities of the

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1/ This definition of access is similar to the one given for accessibility by Wingo, Lowdon, Jr., Transportation and Urban Land, Resources for the Future, Inc., Washington, D.C., 1961, p. 26. Wingo said that accessibility is a quality of location with respect to the array of economic activities.

2/ For some purposes it is useful to distinguish between access characteristics of a location and site quality. Site quality would include those factors which are confined to the site itself and which affect what can be done on the site. Examples would be soil type, ground water, and slope. Access, then, refers to those factors external to the site where distance and movement are involved. Obviously there exists a host of factors associated with location, and divisions into such classifications are arbitrary. For example, sewer availability is a service external to the site, and yet, once installed, is a feature of site quality.

3/ Wingo, op. cit.

people; (2) to the east of the city where major employers are Mather Air Force Base and Aerojet General Corporation; and (3) to the northeast around McClellan Air Force Base.

These opportunities outside the central area are probably the main reasons why residential development has been concentrated in the San Juan subarea (Figure 1). The development in San Juan has been aided by the natural beauty of the area, the availability of water and utilities, and the presence of major recreation areas northeast of the city, such as Folsom Lake and the mountains which offer both winter and summer recreation. Moreover, San Juan is situated between two major highways, and the main employee entrances to Mather Air Force Base and Aerojet General are from the north via Folsom Boulevard (U.S. 50). The latter helps explain the development to the north, rather than to the south of Aerojet.

The employment pull of population will remain strong in the San Juan subarea in the future, since many types of employment are interrelated with the location of population. There are several industrial developments taking place, however, that will enhance employment opportunities southeast (Elk Grove and Sheldon), and north (Natomas) of the city.

Potential sites for industrial development to the south are: (1) southwest of Mather Air Force Base in the noise zone of the major approach used by large jet-propelled airplanes; (2) across Jackson road from the Mather noise zone and west toward Sacramento, an area boxed in by railroads and high voltage power lines; and (3) Elk Grove, which will be near the intersection of two freeways and a major railroad. Industrial development already has begun in these areas and its potential is high. These areas are close to the central city, which also offers many employment opportunities.

Future development of the Natomas subarea will be aided by the location of the new county airport in the area. The airport itself will create employment opportunities and, in addition, it will attract new industry.

The population-business complex.--The common saying "Those who have, get," characterizes the influence of the population-business complex on the direction of residential development. The greater the population of a given subarea and its adjacent subareas, everything else being equal, the greater the chance of additional persons locating in the subarea--provided the subarea is not already populated to capacity. Population attracts population.

In the last section it was pointed out that a reasonable explanation for population concentration in San Juan included the industrial (including military bases) job opportunities. But certainly, not all of the people in San Juan are employed in these jobs. Many work in downtown Sacramento, and job convenience could be improved by living somewhere else. Many others are employed in the San Juan subarea itself.

The population already there attracts more population because of the interrelations between population and business. A subdivision often is large enough for the location of a retail grocery store. A larger subdivision, or a group of subdivisions, usually is associated with a shopping center of several retail stores. As population continues to grow in a particular direction from the central city, large downtown department stores open branch stores in that direction, new stores locate there, and many service businesses are established. All of these businesses locate because of people, and additional people are attracted because of the services and employment opportunities of the businesses. The location of business in outlying areas reduces the frequency of shopping trips into the central city, and some people locate a considerable distance from the place of employment for this reason.

It seems that the present locations of people give the San Juan, Sacramento, and North Sacramento subareas an advantage over other subareas with respect to attracting future population.

Freeway development.--Another important characteristic of access is freeway development. A new freeway into an undeveloped subarea can reduce travel time to the city and place of employment and thus stimulate residential development. Highways do not always precede development, however. Often they are built after the subareas have become congested.

Construction of the Sacramento-Roseville Freeway is a good example of highway and population interreaction. The area served by the freeway began to experience rapid growth about 1946, 10 years before the freeway was completed, because of employment opportunities. Between 1950-60 the school districts on both sides of the freeway (Grant and San Juan) absorbed about two-thirds of the county's population growth. School enrollment figures show a relatively smooth annual growth pattern between 1946-60, without a

spurt in the years immediately following completion of the highway.[1] This suggests that the growth in population brought the freeway.

However, there is other evidence that continual population growth would have been hindered by congestion and that the highway brought further population increases.[2] At the time of the opening of the freeway, a developer was ready with a large tract of homes at one of the interchanges four miles from the nearest suburban residential area. By 1960 development activity had begun on all property adjacent to the freeway. The land along the freeway began to rise in value as soon as construction began in 1953, and by 1960 had risen from less than $700 per acre to over $3,500 per acre. Land values in similar areas without a freeway did not rise as much.

As new freeways are constructed, it is expected that residential development will follow. Existing, adopted, and proposed freeways for Sacramento County are shown in Figure 3; the projected timetable of construction for these freeways are in Table 6.

The map and the timetable give an indication as to where and when future urban development will take place, insofar as the development is influenced by freeway construction. The San Juan subarea will continue to experience growth because of the existing Roseville Freeway. Growth in the Elk Grove subarea will be stimulated by the recent completion of route 4 between points l and cc on the map, and the scheduled completion of route 238 between o and p by 1970. Other subareas that will benefit from freeways within the next 10 years are Mather, Folsom, and Natomas.

Public utility development.--Central sewage disposal systems are increasingly a prerequisite to urbanization.[3] It is especially true in Sacramento County because of the abundance of hardpan soil which is unsuited for private septic tank systems when the land is densely settled.

In 1960, some 129,000 persons in Sacramento County were dependent on private septic tanks. Many of these are unsatisfactory and proposed new

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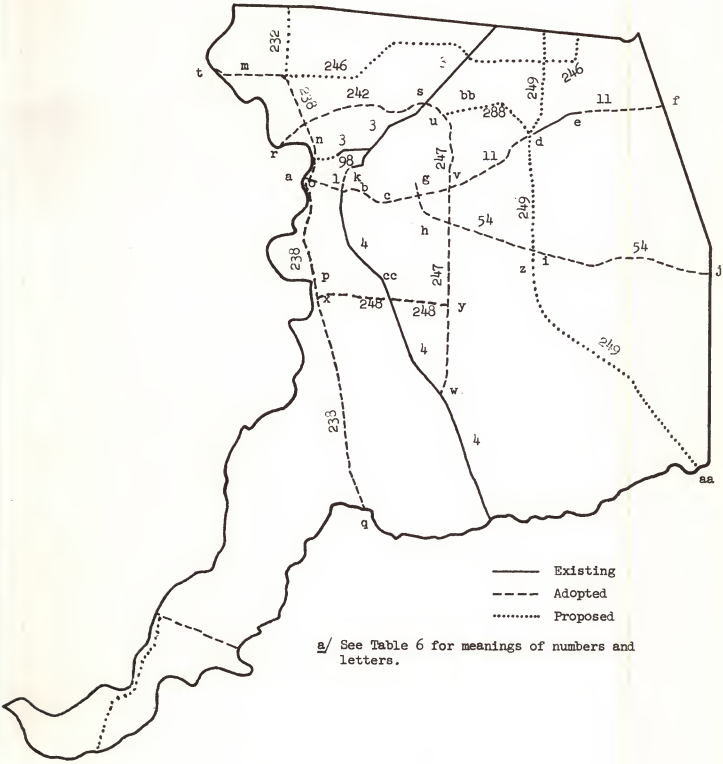
1/ See "Sacramento County Population Study" Data Sheet No. 2.
2/ See Frankland, Bamford, "Rural Fringe," California Highways and Public Works, Vol. 40, Nos. 3-4, March-April, 1961, pp.30-34.
3/ For a case study see Lessinger, Jack, "A Theory of Rural-Urban Transition," Preliminary Draft, May 1, 1962, Chapter VI.

FIGURE 3

The Planned Sacramento County Freeway System[a]



a/ See Table 6 for meanings of numbers and letters.

TABLE 6

Timetable of Freeway Construction in Sacramento County

Freeway route		Points on Figure 3		Estimated date for	
Number	Name	North or west limit	South or east limit	Beginning construction	Opening
3	Roseville			Completed	
4	South Sacramento			Completed	
11	El Dorado	a	b	May 1963	Jul. 1967
11	El Dorado	b	c	Mar. 1964	Nov. 1966
11	El Dorado	c	d	Apr. 1963	Oct. 1965
11	El Dorado	d	e	Completed	
11	El Dorado	e	f	Jun. 1966	Jun. 1968
54	Jackson	g	h	Jul. 1966	Jul. 1968
54	Jackson	h	i	May 1974	Sept. 1976
54	Jackson	i	j	Feb. 1977	Oct. 1979
98	30th Street	k	l	Dec. 1964	Nov. 1966
238	Westside	m	n	Jun. 1966	Dec. 1968
238	Westside	n	o	Apr. 1965	Sept. 1967
238	Westside	o	p	Mar. 1968	Nov. 1970
238	Westside	p	q	Jan. 1970	Jul. 1972
242	Beltline	r	s	Jul. 1967	Oct. 1970
246	Elkhorn-Auburn	t	m	Sept. 1977	Sept. 1980
247	Elk Grove-Arcade	u	v	Jun. 1970	Nov. 1972
247	Elk Grove-Arcade	v	w	Mar. 1976	Oct. 1978
248	South	x	y	Jun. 1978	Dec. 1980
249	Eastside	d	z	Feb. 1975	Sept. 1977
249	Eastside	z	aa	Feb. 1978	Nov. 1980
288	Fair Oaks	s	bb	Apr. 1972	Oct. 1974

Source: California Department of Public Works, Division of Highways.

systems are checked carefully by public health authorities before approval is given.[1]

Development of most of the areas in Sacramento County must wait for adequate sewage disposal systems. The County's Public Works Department has a master plan for sewerage facilities, but no timetable for installations. Installation plans usually are initiated by property owners and real estate developers, and before construction begins, the method of financing the project must be determined.

Based on current and recent construction activity it seems that the San Juan, Sheldon, and Elk Grove subareas have a greater potential for residential development than do other areas, insofar as sewers are a determining factor.

Another important factor in determining development, and which falls in the public works category, is the availability of ground water. The eastern and southeastern parts of Sacramento County lack sufficient ground water for urban development. This means that water must be made available before the Clay subarea, and possibly parts of the Galt, Elk Grove, Sheldon, and Folsom subareas, can be developed.

The Bureau of Reclamation has proposed the construction of a canal--the Folsom South Canal--that could supply some of the water needed in these areas (Figure 1).[2] However, the feasibility of this canal has been justified on the basis that the water would be used for agricultural purposes, and there is some question whether it could be used for urban purposes in the future. Additional water could be supplied by the proposed County-Line Reservoir along the eastern edge of the county at the upper reaches of Deer Creek. (Figure 1).[3]

Population Projections by Subareas

The subarea delineation, as given in Figure 1, is similar to the one given in a report on Sacramento's recreation and park needs, with two

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1/ McKee, Jack E., and William R. Samples, The Sacramento County Sewerage Survey, 1959-60; Bewante and Stowell, Sanitary and Civil Engineers, Sacramento, California.

2/ See U.S. Department of the Interior, Bureau of Reclamation, Folsom South Unit, Sacramento, California, January 1960.

3/ Sacramento Profile--A Physical Organization Plan of the County, prepared by the Sacramento County Planning Department, June 1963.

modifications.[1] The boundary of the Elk Grove subarea was moved to the west to coincide with the proposed freeway. The land to the west of the freeway will probably remain in the flood plains, and the whole Delta subarea is expected to be retained in agricultural use because of its flood plains and soil structure. The subarea name "Consumnes" was changed to "Clay" to avoid confusion with the Consumnes River.

The boundaries of these subareas are suited well for this study. They follow topographical features, such as railroads and rivers, that act as social and economic barriers, making the subareas relatively homogeneous with respect to urban settlement. A great deal of urbanization can occur in one subarea before any activity occurs in adjacent subareas. The subareas are not necessarily homogeneous with respect to agriculture, however. For example, the Consumnes River divides urban subareas, but agriculture is similar on both sides of the river.

To determine the recreational needs by subareas, the authors of the recreational report projected population to 1980. These figures are reproduced in Table 7, with an adjustment in the Elk Grove and Delta figures to allow for the boundary change. High percentages of the population increase are expected to settle in the Sacramento, San Juan, North Sacramento, and Elk Grove subareas.

Detailed projections for 10-year periods up to the year 2000, also have been made for high school districts (Table 8).[2] The district boundaries are shown in Figure 4. Very little change is expected in Courtland and Rio Vista districts; high rates of growth are expected in the 1960s for Roseville, San Juan, and Folsom districts, but the rates are expected to drop in the future. The rate for the Elk Grove district is expected to increase in the future.

Additional insight into the direction of urban growth is seen in Table 9. The projected absolute changes by high school districts are shown as a percent of the total projected change for the county. The percentage of the total

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1/ Pacific Planning and Research, A Report on the Park and Recreation Space Needs of the Sacramento Metropolitan Area, July 1960.
2/ Sacramento County Population Study, Data Sheet No. 2.

TABLE 7

Population Projections by Subareas

Planning area	Population 1958	Population 1980	Percent change 1958-80	Absolute change	Change as percent of total
Natomas	7,420	45,000	506.5	37,580	4.9
North Sacramento	61,560	140,700	128.6	79,140	10.4
San Juan	126,640	290,000	129.0	163,360	21.4
Mather	8,240	48,000	482.5	39,760	5.2
Folsom	6,140	14,400	134.5	8,260	1.1
Sacramento	223,230	516,000	131.2	292,770	38.4
Sheldon	4,260	42,500	897.6	38,240	5.0
Clay	500	2,000	300.0	1,500	.2
Elk Grove[a/]	9,000	72,200	702.2	63,200	8.3
Delta[a/]	7,580	8,400	12.1	920	.1
Galt	3,430	40,800	1,089.5	37,370	5.0
Total Sacramento County	458,000	1,220,000		762,000	100.0

a/ Figures adjusted to allow for boundary change.

Source: Pacific Planning and Research, A Report on the Park and Recreation Space Needs of the Sacramento Metropolitan Area, July 1960, p. 12.

TABLE 8

Population Projections by High School Districts, Sacramento County

District	Population						Percent change				
	1950	1960	1970	1980	1990	2000	1950-1960	1960-1970	1970-1980	1980-1990	1990-2000
Courtland[a]	3,448	3,500	3,900	4,200	4,700	5,200	1.5	11.4	7.7	11.9	10.6
Elk Grove	10,145	18,500	32,000	63,000	137,000	307,000	82.4	73.0	96.9	117.5	124.1
Folsom	8,854	22,800	47,000	95,000	170,000	250,000	157.5	106.1	102.1	78.9	47.1
Galt[a]	3,332	4,700	6,700	9,800	14,600	21,600	41.1	42.6	46.3	49.0	47.9
Grant	46,053	97,000	180,000	308,000	500,000	762,000	110.6	85.6	71.1	62.3	52.4
Rio Vista[a]	3,853	4,000	4,000	4,000	4,000	4,000	3.8	.0	.0	.0	.0
Roseville[a]	166	2,500	13,400	27,000	41,700	52,200	1,406.0	436.0	101.5	54.4	25.2
San Juan	35,793	134,000	272,000	414,000	530,000	600,000	274.4	103.0	52.2	28.0	13.2
Sacramento	165,496	213,000	271,000	335,000	398,000	438,000	28.7	27.2	23.6	18.9	10.1
TOTAL	277,140	500,000	830,000	1,260,000	1,800,000	2,440,000	80.4	66.0	51.8	42.9	35.6

a/ Districts extend into other counties, but population figures are for Sacramento County only.

Source: Sacramento County Population Study, Data Sheet No. 2.

FIGURE 4

High School Districts in Sacramento County

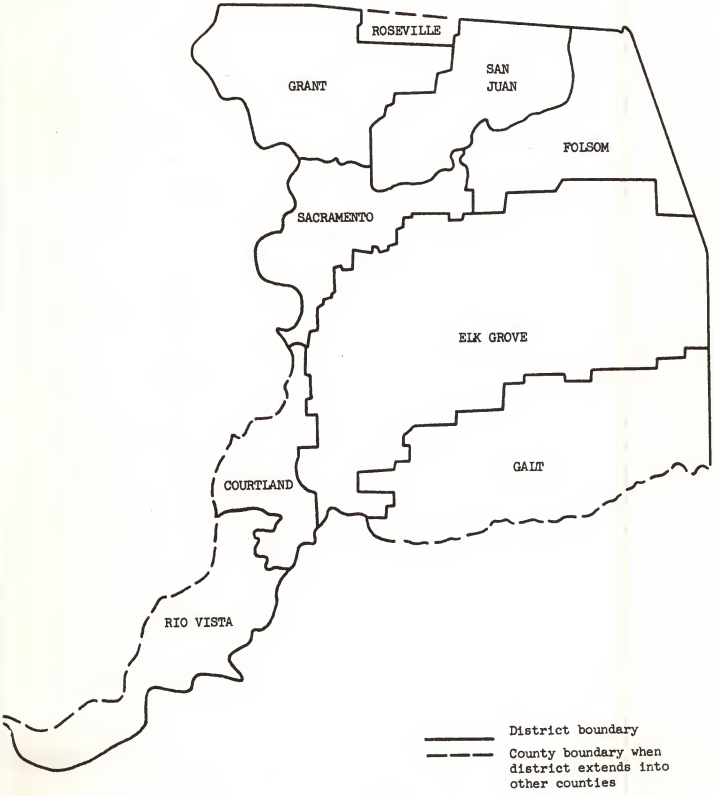

TABLE 9

Projected Absolute Changes in Population of High School Districts and Changes as Percent of Total Changes

District	Absolute change between					Percent of total change between				
	1950 and 1960	1960 and 1970	1970 and 1980	1980 and 1990	1990 and 2000	1950 and 1960	1960 and 1970	1970 and 1980	1980 and 1990	1990 and 2000
Courtland	52	400	300	500	500	.0	.1	.1	.1	.1
Elk Grove	8,355	13,500	31,000	74,000	170,000	3.7	4.1	7.2	13.7	26.6
Folsom	13,946	24,200	48,000	75,000	80,000	6.3	7.3	11.2	13.9	12.5
Galt	1,368	2,000	3,100	4,800	7,000	.6	.6	.7	.9	1.1
Grant	50,947	83,000	128,000	192,000	262,000	22.9	25.2	29.7	35.5	40.9
Rio Vista	147	0	0	0	0	.1	--	--	--	--
Roseville	2,334	10,900	13,600	14,700	10,500	1.0	3.3	3.2	2.7	1.6
San Juan	98,207	138,000	142,000	116,000	70,000	44.1	41.8	33.0	21.5	10.9
Sacramento	47,504	58,000	64,000	63,000	40,000	21.3	17.6	14.9	11.7	6.3
TOTAL	222,860	330,000	430,000	540,000	640,000	100.0	100.0	100.0	100.0	100.0

Source: Derived from Table 8.

population increase absorbed by the San Juan and Sacramento districts decreases each decade, and that of Elk Grove, Folsom, and Grant districts increases.

Summary of Urban Growth

Sacramento County's rapid urban growth is consuming land at a rapid rate. The land withdrawn for urban purposes now is approximately twice the amount actually developed for urban purposes, and there is a likelihood that the same trend will continue. If it does, then substantially all of the expected residential area will be withdrawn for urban purposes sometime around 1995. This does not mean, however, that agriculture will be eliminated. About 300 square miles or 30 percent of the land in the county is expected to remain in nonurban uses.

The urban center around the city will expand simultaneously in all directions, but the areas to the south and northeast seem to have a greater level of access for the immediate future. That is, these areas are favored by employment opportunities, the population-business complex, and freeways. By the year 2000 or so most of the county except for the extreme southeast area and the Delta region should be urbanized. If water is made available to the southeast, it too can be partly developed. It is unlikely that the Delta ever will become urban.

AGRICULTURAL LAND USE

Modern commercial agriculture is characterized by rapid change. New technology, new products, changes in tastes, changes in product prices and in prices of purchased inputs, in rents and taxes, in nonfarm opportunities, and so on, result in a constantly shifting pattern of enterprise combinations in most areas. Sacramento County is no exception. The following discussion places the impact of urban growth on land use into perspective with other causes of change in agriculture.

The Basic Data

Shifts in relative importance of commodities and land use can be seen in Tables 10, 11, 12, and 13. The general farming areas in the county in

TABLE 10

Changes in the Ten Highest Enterprises in Sacramento County Agriculture, Ranked by Value, in 1947 and 1957-62

Enterprise	Year						
	1947	1957	1958	1959	1960	1961	1962
	percent of total						
Cattle and calves	7.2	14.4	15.9	15.4	16.3	17.3	18.7
Tomatoes	11.1	6.2	9.0	3.8	8.1	10.5	11.6
Pears	8.9	9.7	5.1	10.4	9.0	11.7	10.1
Milk	9.5 a/	12.3 a/	11.7 a/	10.0	9.6	9.9	9.2
Eggs	9.0 a/	6.0	9.0 a/	4.7	5.5	7.0	6.3
Corn	(.3) b/	10.6	13.5	10.1	8.9	7.6	4.3
Hops	8.4	4.1	5.7	5.0	4.0	2.7	3.9
Rice	(2.0)	(1.6)	(2.0)	3.1	3.4	3.1	3.7
Alfalfa hay	7.1	5.9	5.8	7.9	8.0	4.7	3.6
Safflower	(--) c/	(.1)	(.7)	(.8)	(.8)	(1.5)	3.4
Sugar beets	4.0	6.2	4.9	7.2	5.0	4.4	(3.1)
Milo	(1.3)	(1.0)	2.4	(1.3)	(2.4)	(1.6)	(2.0)
Dry beans	4.7	(.9)	(.6)	(.5)	(.6)	(.2)	(.2)
Grapes	3.6	(.3)	(.2)	(.1)	(.2)	(.3)	(.1)
Wheat	(2.7)	3.2	(1.2)	(1.1)	(1.4)	(1.3)	(1.8)
Top ten share of total	73.3	78.6	83.0	77.5	77.8	78.9	74.8
	millions of dollars						
Total value of all commodities	41.2	53.4	54.4	58.4	63.6	64.4	67.0

a/ Includes other related commodities.

b/ Parentheses indicate not in top ten for the year.

c/ Not on list of commercial products.

Source: Sacramento County Agricultural Commissioner's Annual Reports.

TABLE 11

Value of Major Categories of Agricultural Output, Sacramento County, 1947 and 1962

Enterprise	Year			
	1947		1962	
	Actual prices	1910-14 prices	Actual prices	1910-14 prices
	millions of dollars			
Field crops	15.5	5.9	20.9	12.4
Livestock, poultry, and dairy	10.5	3.6	26.5	10.4
Fruit, nut, and berry crops	9.0	4.8	8.8	3.9
Vegetables and seed crops	6.6	2.5	10.9	4.0
TOTAL	41.6	16.8	67.1	30.7

Source: Sacramento County Agricultural Commissioner's Annual Reports. Value deflators are indexes of prices received by farmers as reported in U.S. Department of Agriculture, Agricultural Prices.

TABLE 12

Value of Products Sold in Census Years 1930-59 at Actual Prices and Deflated by 1910-14 Prices

	Census of						
	1930	1935	1940	1945	1950	1954	1959
	thousands of dollars						
Actual Prices							
Value of products sold	16,117	N.A.[a]	10,885	32,436	35,318	41,199	54,306
Field crops	3,860	N.A.	3,443	7,963	12,251	15,922	18,044
Vegetables	4,852	N.A.	1,398	5,398	4,127	3,398	3,708
Fruits, nuts, and grapes	4,413	N.A.	2,119	8,259	3,874	6,253	6,185
Poultry	1,129	N.A.	1,475	4,247	5,010	4,472	4,008
Dairy	1,484	N.A.	1,020	2,985	4,141	4,554	6,552
Livestock other than poultry and dairy	1,791	N.A.	935	2,110	5,485	5,818	15,004
1910-14 Prices							
Value of products sold	10,890	N.A.	11,458	16,465	14,127	16,748	22,628
Field crops	2,991	N.A.	4,919	4,712	6,414	7,475	10,936
Vegetables	3,542	N.A.	1,427	2,287	1,779	1,573	1,578
Fruits, nuts, and grapes	3,369	N.A.	2,864	3,545	1,977	2,992	2,877
Poultry	701	N.A.	1,536	2,399	2,267	2,512	2,803
Dairy	894	N.A.	927	1,345	1,643	1,851	2,549
Livestock other than poultry and dairy	1,155	N.A.	850	1,111	1,764	2,059	4,794

a/ N.A. = not available.

Source: U.S. Bureau of the Census, Agricultural Census for the years shown. 1910-14 prices from U.S. Department of Agriculture, Agricultural Prices.

TABLE 13

Selected Agricultural Land Use and Livestock Data for Sacramento County

	Census of						
	1930	1935	1940	1945	1950	1954	1959
	acres						
Land in Farms	573,025	486,529	431,379	545,474	556,545	551,732	546,988
Cropland, not pastured a/	257,075	256,481	237,445	240,001	245,936	225,467	215,753
Cropland, harvested	201,480	204,255	167,807	192,907	194,459	191,530	178,851
Land pastured b/	292,846	211,624	N.A. e/	285,247	288,389	306,627	305,004
Improved pasture c/	N.A.	N.A.	N.A.	N.A.	N.A.	16,139	29,808
Other land d/	23,104	18,424	N.A.	20,226	22,220	19,638	26,231
Irrigated land	N.A.	N.A.	N.A.	N.A.	132,341	147,150	171,049
Crops, harvested							
Corn	4,124	1,957	3,133	3,293	5,152	9,505	30,704
Sorghum for grain and seed	840	3,408	4,165	10,661	8,530	8,590	10,302
Small grains	13,378	30,597	31,593	30,145	22,527	17,777	13,487
Rice	677	3,408	4,165	3,785	9,332	14,492	9,129
Hay, cut	31,053	27,216	28,123	35,755	45,130	45,627	45,327
Vegetables for sale	36,781	32,572	16,292	25,095	12,757	10,163	12,705
Tomatoes	2,621	4,038	4,805	13,665	8,207	7,892	9,071
Fruits, nuts, and grapes	46,638	33,484	23,218	21,953	16,432	10,823	9,288
Bartlett pears	N.A.	N.A.	N.A.	N.A.	4,406	4,601	5,117
	numbers						
Livestock data							
Cattle and calves	29,878	31,654	27,598	46,935	54,662	84,133	83,761
Hogs and pigs	9,996	7,256	8,281	10,889	10,820	7,455	5,830
Sheep and lambs	60,347	44,404	17,314	34,270	32,552	29,893	18,788
Chickens	595,581	524,630	497,072	625,517	573,172	643,491	618,512

a/ Includes (1) cropland harvested, (2) cropland not harvested and not pastured.

b/ Includes (1) cropland used only for pasture, (2) woodland pasture, and (3) other pasture (not cropland or woodland).

c/ Includes pasture for which one or more of the following practices has been used: liming, fertilizing, seeding, irrigating, draining, or clearing of weed or brush growth.

d/ Includes (1) woodland not pastured and (2) other land (house lots, roads, wasteland, etc.).

e/ N.A. = not available.

Source: U.S. Bureau of the Census, Agricultural Census for the years shown.

1930 and in 1961 are shown in Figures 5 and 6, and locational reference points are shown in Figure 7.

Rangeland in 1961 was largely in the eastern third of the county, with some scattered over the western two-thirds. The land in the Sacramento, San Juan, and Mather subareas virtually has been withdrawn from agriculture although the land is by no means all developed for urban purposes. The vineyard areas south of Sacramento are gone, and land near the Consumnes and Dry Creek (southern boundary of county) rivers produced more row crops in 1961 than in 1930. Irrigated pasture dominates a large part of the southern area now. Little change has occurred in the northwest area except for the expansion of rice and the shift of orchards. In the Delta some land has shifted between orchards and row crops but is essentially similar in terms of land use.

Many of the changes in Sacramento agricultural enterprises reveal a shift to more intensive land uses (more labor and capital per unit of land), which is characteristic of an agricultural area near an urban center.[1/] These changes may be partly the result of pressure of rising land values and real estate taxes. In spite of an actual decline in the total amount of land in farms, the total value of output has increased from $41.6 million in 1947 to $67.1 million in 1962. This has meant a greater expenditure on purchased inputs per acre but not necessarily higher net returns. It has not been accomplished by substantially increased specialization. The top ten enterprise categories composed three-quarters of the total value of farm production both in 1947 and in 1962.

Changes in Major Agricultural Commodities[2/]

Rangeland and Meat Animal Production

Cow-calf and other range-using enterprises are found principally in the eastern part of the county. Scattered areas of range are left in the western part of the county in situations where the land is rolling and soils are

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1/ See Tarver, James D., "Ecological Patterns of Land Tenure, Farm Land Uses, and Farm Population Characteristics," Rural Sociology, Vol. 28, No. 2, June 1963.

2/ Floricultural and nursery operations which are important in the urban areas of San Francisco and Los Angeles are not expected to be of major importance in Sacramento because of climatic conditions.

FIGURE 5

General Farming Areas in Sacramento County, 1930

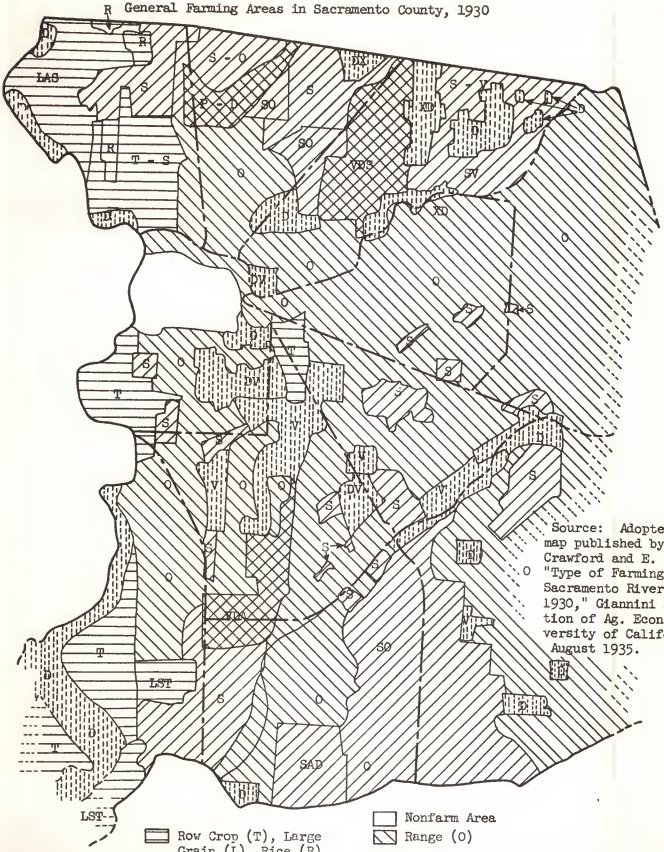


FIGURE 6

General Farming Areas in Sacramento County, 1961

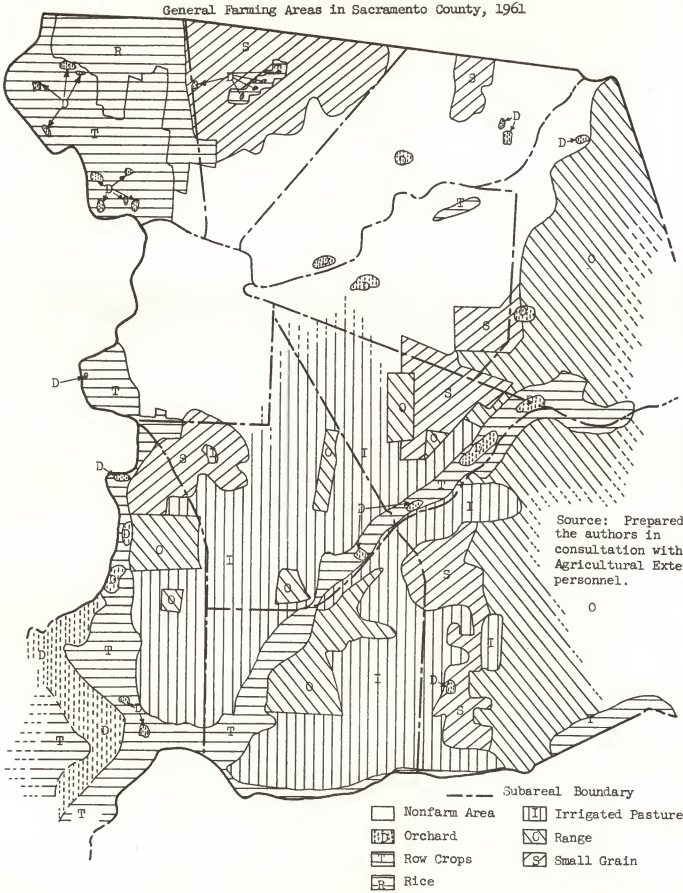
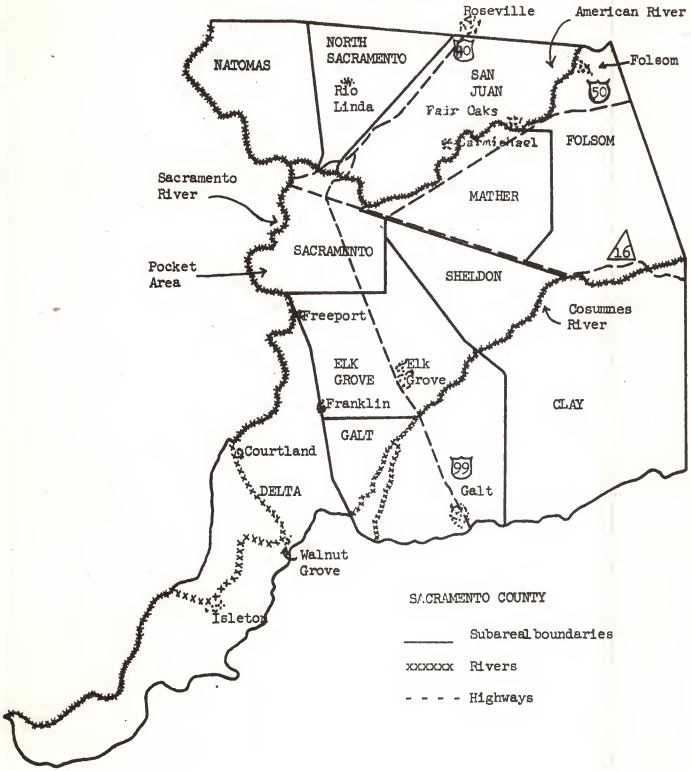


FIGURE 7

Locational Reference Points and Subareas



shallow or rocky. In some range areas there are small valley pockets that may be leveled and irrigated; however, ground water is not sufficient to allow large-scale irrigation, except perhaps in the area north of Galt. Irrigated pastures are found in the southern part of the county and are used in dairying enterprises.

The production of cattle and calves has been the leading single enterprise in terms of farm cash receipts (Table 10) since 1952. The number of cattle and calves, including dairy cows, increased almost threefold between 1930-59; the value in constant dollars of livestock sold, other than dairy and poultry, increased over fourfold. Meat production of hogs and sheep declined (Tables 12 and 13).

The county farm advisors estimate that there were no cattle being fattened in specialized drylot operations in 1950. In 1955, some 15,000 head were on feed; by 1960 the number had risen to 42,500; and by 1961 to 60,000. The increase of the number of cattle in feedlots was greater than the total increase (Table 13), indicating that the number of cattle on range declined.

Figures 5 and 6 show that some of the range area south and east of the city was lost to urbanization, but that other range was lost to more intensive agricultural uses, such as irrigated pasture for dairying. The two types of shift appear to be about equal in magnitude. It might be argued that urbanization indirectly induces more intensive agricultural use of land and thus both types of shift might be indicated as an impact of urban growth.

Except for small patches of rangeland in the Elk Grove and Sheldon subareas, it seems that the rangeland in the county will be relatively free from urban encroachment, during the next 20-30 years. This does not mean, however, that increasing taxes and land values will not affect profit margins of range operations.

Irrigated Pasture and Dairy Farming

In recent years the production of market milk (Grade A) has exceeded substantially the production of milk for manufacturing (Grade B). This reflects the increased availability of contracts for Grade A producers and also a narrowing of the difference in the costs of producing the two grades. This

change is partly the result of urban growth in the area. The population growth has increased the demand for fluid milk, and the expansion of the urban area has increased costs of production through tax increases and land costs.

The shift and the expansion in total milk output has allowed the value of milk production to remain in a high position relative to that of other farm enterprises--holding second, third, or fourth place since 1947 (Table 10). Between 1930-49 the value in constant dollars of dairy products has increased almost threefold (Table 12); between 1954-59 the amount of improved pasture almost doubled (Table 13). In 1961 all 275 Grade B and most of the 80 Grade A dairies used irrigated pastures as a feed source during summer months.

About ten of the dairy operations can be classed as drylot or semidrylot operations, and this number is expected to increase. This can be traced, in part, to urban growth. The combined pressures of rising operating costs, not the least of which is labor, and changing technology have encouraged increasing the size of the milking operation. Also it is possible to produce some 30 percent more forage per acre as mechanically-harvested green chop than as cow-harvested feed. Combining these factors with the rise in the value and tax burden of land adjacent to existing dairies indicates why the continued expansion of the more land-intensive form of organization is expected.

Irrigated pasture is estimated to exceed 50,000 acres.[1/] The bulk of development occurred between 1940-50, with around 10,000 acres developed since the latter year. The land used for irrigated pasture must be leveled. Since it is typically hardpan land, production falls off due to soil compaction; the planting must be reestablished in 8-10 years. A crop of grain, clover seed, or both, is harvested as the pasture grasses are becoming established. In the period of the pasture establishment more feed can be produced per acre with the nurse crops than with pasture. But soil structure will not allow continuous cropping of the nurse crops. Clover seed production fits easily into irrigated pasture development. In 1950, 1,300 acres

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1/ Estimated by county farm advisors. This is higher than the "improved pasture" figures given by the census (Table 13), since some of the irrigated pasture is reported as cropland used for pasture by the census.

were harvested for clover seed, while in 1960, 3,408 acres were harvested. In 1960, clover seed accounted for over $725,000 in proceeds. Clover production on pasture is another element in increasing the intensity of land use.

The production of milk, irrigated pasture, and clover seed is concentrated in the area south of the City of Sacramento, mainly in the Elk Grove and Galt subareas. In 1930, when there was almost no irrigated pasture, this land was about equally divided between range and cropland; and the cropland was divided about equally between dry farming of small grains and orchards or vineyards.

Urban land use has not directly replaced dairy farms to any extent. In fact, the urban growth has stimulated the dairy industry over the years (Tables 12 and 13). Urban growth has been principally in the northeastern part of the county, and the dairy industry, with irrigated pasture on hardpan land, has sprung up south of the city, replacing the less profitable range and small grain operations.

Recently, however, urban growth rapidly has been approaching the dairy farms. This has caused land values and taxes to rise, increasing the cost of dairy operations. In the future, it is expected that urban growth will overtake most of the present dairy operations. This means that the dairy industry will have to locate elsewhere.

Demand for fluid milk will increase. As of now milk cannot be transported cheaply long distances; therefore, the industry will have to relocate close to Sacramento. This new location may be outside the county, since projected urban growth within the next 30-40 years indicates that the only areas left within the county that would probably be used are the Delta and the southeastern part of the county.

It is doubtful that the dairy industry could compete with the profitable fruit and vegetable production in the Delta. The lack of ground water on the rangeland in the southeast (Clay subarea) would prevent both irrigated pasture and drylot operations from locating there.

There are two possible solutions to keeping the dairy industry within the county. If the Folsom South Canal and the County-Line Reservoir are built, then there may be sufficient water for the southeastern part; however,

the water also may stimulate urban development there. The second alternative is to create "cow-cities," such as exist in the Los Angeles area. This could prevent or at least delay urbanization of the present dairying area or of any future dairying area.[1/]

Poultry

Poultry products--mainly eggs--are another consistently leading category of agricultural output. In 1947 cash receipts from eggs ranked third in importance; in 1962 they ranked fifth (Table 10). Since 1930 the cash receipts in constant dollars has increased fourfold (Table 12). The nearly $3 million annual egg output is supplemented by an output of fryers and turkeys valued at over $500,000. Poultry operations, like other drylot feeding operations, do not rely on soil characteristics for location. It may be preferable to have well-drained soil, but essentially the poultry industry is located where production facilities just happened to have been established.

The Rio Linda area (North Sacramento subarea) is an excellent illustration. Land was subdivided after World War I and sold as small orchard units. Hardpan soils spelled the failure of these enterprises, and the shift to poultry was well underway by 1925. Shortly thereafter a feed cooperative was formed. Now about three-quarters of the county's poultry output comes from this area. The remainder of the county's output is largely in the southeastern section where land is available at lower prices.

In the future, the high price of land, as well as the other effects of increased urbanization, may cause a shift away from the Rio Linda area. This area rapidly is becoming urbanized, and the present poultry operations create fly and odor problems for nearby residents. In another 20 years or less, urbanization should force the poultry operations to relocate elsewhere. Just as with dairy operations, the best area for relocation within the county seems to be in the southeast. However, special incorporated areas may be the only way poultry enterprises can be kept within the county in the long run.

1/ A review of the "cow-cities" in the Los Angeles area suggests that they have allowed farm operators to slow down but not eliminate tax pressures. A shift to commercial and industrial land uses is in evidence. Excessive residential uses of land that are incompatible with livestock operations have been prevented. For a study dealing with the location of the dairy industry see Fletcher, L. B., and C. O. McCorkle, Jr., Growth and Adjustment of the Los Angeles Milkshed, California Agricultural Experiment Station, Bul. 787, June 1962.

In recent years, there has been a drastic decline in the number of poultry operations. In 1954 there was about 590 poultry farms; in 1961 there were about 185. By 1965 it is projected that there will be only 100 farms. Total egg production, however, has expanded and is expected to expand more. The decline in number of operators is in line with the dramatic changes in technology that have swept the industry nationally. Urban effects probably have had but a small part in this concentration of output among fewer firms in Sacramento County.

Fruits, Nuts, and Berries

The production of fruits, nuts, and berries as a group has been declining over the years, although for some crops within the group it has increased. Total acreage dropped from 46,638 in 1930 to 9,288 in 1959; and the value of output in constant dollars decreased 15 percent (Tables 12 and 13).

Pears.--Orchard output is dominated by pears (mainly Bartlett), which have been a consistent top-value category (Table 10). Some new plantings of other orchard crops, such as freestone peaches and prunes, have been made in recent years, but most of the new tree plantings have been in pears. These have been concentrated in the Delta subarea from Freeport south to Isleton. Some of the new pear plantings have resulted, at least in part, from the reduction in bearing acreage caused by pear decline. The value of pear production in 1962 was approximately three-fourths the total value of all fruits, nuts, and berries (Tables 10 and 11). Most of the pear production is located in the Delta subarea, and it is expected to remain there. As pointed out previously, the Delta subarea, because of soil characteristics and floods, is not likely to become urbanized.

Almonds, olives, and walnuts.--The acreagesof almonds, olives, and walnuts have declined significantly in the face of recent urban growth in the San Juan and Folsom subareas. Walnut acreage along the American River, olive acreage in the Fair Oaks, Carmichael, and Folsom areas, and almond acreage north of the American River have been removed. In addition, some mixed plantings have been affected in the North Sacramento subarea. While most of this decline in acreage has been due to urbanization, some acreage would have gone out of production due to other competitive pressures.

Grapes.--Grape production has experienced the most dramatic decline. In 1962 grape production was valued at approximately $80,000; in 1947 it was worth about $1,470,000. The hardpan soils in the Elk Grove subarea on which many of these grapes had been planted proved unsatisfactory. The Sacramento grapes could not compete with those grown in other areas no further away than Lodi in San Joaquin County. Irrigated pasture has taken over the poorer grape land, while the better land has gone into row crops. Thus, urban growth was not the principal cause of the decline in grape production, except perhaps for some scattered acreage north of the American River.

Hops.--Hops are an important specialty crop. Hop fields are not used for other crops, and thus are similar to orchard crops, although their value is often reported along with field crops. In recent years their value has ranked between seventh and tenth, which represents both a relative and an absolute decline. Prices have not been as high as in previous years due to the heavy supply available from imports and from Idaho and Oregon where labor, land tax, and water costs reportedly are lower and where alternative crops are not as attractive.

In 1960, 2,863 acres produced $2.5 million compared to 3,267 acres in 1950 that produced $4.0 million. Acreage was 3,332 in 1959 and 2,221 in 1961. All acreage in hops along the American River is expected to be lost to urban development, although if it were not to be shifted to urban use, it well might be shifted to other high-valued crops as soon as the specialized equipment needed for hops had to be replaced. The American River acreage will represent a loss of some 700 acres and $700,000 in output. The area along the Cosumnes River near Sloughhouse is the major hop-producing area in the county, and it is expected to remain in hop production in the near future as long as competition can be met. In the not so distant future the urban residential area will expand to this area, although there is a possibility that the land along the Cosumnes River will remain a permanent greenbelt zone.

Row Crops, Field Crops, and Table Vegetables

Land used for annual cash crops typically is operated in a fairly systematic rotation plan to promote soil structure and fertility and to control diseases and pests. Crops of high value, like sugar beets, tomatoes, corn, and grain sorghum are balanced with wheat, barley, safflower, and alfalfa. The number of years land will be used intensively, or even the choice of crops

to be rotated, depends upon the physical characteristics of the land, the complementary operations, the preferences of the operator, and relative prices. Many of these factors differ over the county.

Field crops as a group are more important as an income source than are livestock (Table 11). Their importance also has increased over the years. Between 1930 and 1959 the value of all agricultural products in constant dollars doubled, but the value of field crops increased more than three times (Table 12).

The importance of table vegetables has declined. Acreage in 1959 was only one-third of the 1930 level, and the real value of output dropped 55 percent (Tables 12 and 13).

Tomatoes.--In terms of total value, tomatoes for processing have been a leading crop for some time. In 1947 and 1951 tomatoes ranked in first place and since then they have varied between second and ninth (Table 10). Acreage reached a peak in 1951, then declined in response to contracting price changes; it seems stabilized now at around 10,000 acres. This acreage produces around $4.5 million in output value. Considerable tomato acreage is in the Natomas subarea, which is in the direct path of urbanization.

Corn.--Corn acreage increased spectacularly from 5,152 acres in 1949 to 50,000 acres in 1959 (Table 13), replacing other small grains. In 1960 acreage dropped to 40,000 partly due to competition from new hybrid sorghum varieties and from safflower. Corn receipts ranked second in 1958 and dropped one place each year to sixth in 1962. Corn is grown in the Delta subarea since adequate yields depend heavily upon large amounts of nitrogen and water, and these inputs are more plentiful in the Delta than in other parts of the county. Because of its location, corn acreage is not in the direct path of urbanization.

Grain sorghums.--Although grain sorghum had its highest total value of output in 1960, $1.5 million, it has not entered the top ten group since 1958. Even with the hybrid varieties, corn usually outyields sorghum in value terms on better land--but under some producing conditions their positions are reversed. Sorhgum is grown in the Delta subarea for the same reasons as is corn.

Sugar beets.--Sugar beets have had a steady climb in acreage as quotas have been raised. Top total value of $4.2 million in 1959, when yields were

particularly good, gave it a value ranking of sixth. It has been eighth or ninth in recent years. For the immediate future, sugar beet production is not expected to increase because of the virus yellow problem. In the more distant future, acreage in the Natomas subarea is in the path of urbanization.

Rice.--Most of the rice production is concentrated near the Sacramento River north of the city (Natomas subarea). In recent years, it has held between eighth and tenth place in the value rankings, after having been above that in the middle 1950s. Acreage has more than doubled since 1940. Water availability and control are prime determinants of location. Quotas on acreage and government price operations have a large influence on total returns. Acreage rose above 10,000 in the mid-1950s when quotas were relaxed.

Land in the Natomas subarea will soon be under value and tax pressures of urban growth, but the total urban effect on rice production is uncertain. Urbanization probably will cause some shifting of production from the Natomas subarea to near Franklin and Galt or out of the county.

Alfalfa.--Alfalfa hay often is grown for three to five years in a crop rotation system. It is a relatively easily harvested crop that does not require annual replanting, and one which has a ready market in local livestock operations. It is demanding in terms of water and depth of soil but has substantial soil-improving characteristics. Its total value exceeded $5.0 million in 1960 when it ranked in sixth place as a revenue producer. It consistently ranks in the second five of the top ten. It is more often found along the rivers, on the edge of the Delta, and in the deep-soil areas in the northwestern part of the county.

Safflower.--Safflower is a recent addition to the roster of commercial crops. It was not reported separately by the Commissioner of Agriculture until 1951, when 3,000 acres produced a value of $255,000. In 1962 it rose to tenth place in the value rankings when it produced $2.3 million on 14,600 acres. The crop needs 18 inches of water per acre, which usually must be provided with preplanting irrigation. It is found in the rice-growing part of the county, along rivers, and in the Delta.

Dry beans.--Dry beans were once a significant part of Sacramento agriculture. In 1947 they ranked eighth in terms of value. They have been systematically replaced by higher value crops until now there are fewer than 1,500 acres in this use.

Wheat.--Wheat is also a former member of the top ten that has been declining in importance, but for different reasons. It was grown quite extensively in the northeastern part of the county (San Juan subarea) on soils that were not suited to, or did not have water for, the more profitable cash crops. Urban use has directly replaced wheat land, and since the national wheat quotas go with the farm and not with the farmer, the acreage for the county decreased during the 1950s. Most of the wheat is now grown in the Delta subarea, where, except for quotas, it would probably replace some of the acres now in barley.

Barley.--Like dry beans, barley is a low-value crop that has been pushed out by more profitable crops, although the national quotas have had some effect on acreage. Barley occupied 70,000 acres in 1950 with a gross value of almost $3.5 million. In 1963 it used less than 10,000 acres.

Asparagus.--At one time asparagus was an important crop in the Delta subarea. Acreage is now about 1,700 down from an all time high of 22,000. The decline was due largely to a disease that prevents replanting.

Changes in Agriculture by Subareas

Sacramento Subarea

The Sacramento subarea is completely urbanized except for the "pocket" area in the southwestern corner, and that will become urbanized within five years. Construction of houses is now underway. The land in the pocket is Class I land and very productive row crop operations will be eliminated. The rest of the subarea is mainly hardpan land and urbanized areas have replaced dry and irrigated pasture.

Natomas Subarea

Between 1930 and 1961 there was a substantial increase in rice, safflower, and tomato production in the Natomas subarea and a decrease in small grains, fruits, and nuts. Urban growth is expected to boom in 10 years or so after the new airport and freeways are built in the subarea. Growth will continue for the next 30 years.

The first crops to go will be row crops and alfalfa, which are the parts of a rotational pattern. The rice land is further from the urban center, out

of the direct path to the airport, and more specialized in its use; therefore, it should be the last to be converted.

North Sacramento Subarea

The southern half of the North Sacramento subarea, which contains the City of North Sacramento, can be classified as urban; and the northern half is well on its way to becoming urban. The present urban area replaced rangeland, some small grain, and a few orchards. The remaining agriculture includes poultry operations and some small grain, with a few orchards and row crops.

San Juan Subarea

The only agriculture remaining in the San Juan subarea is small grain and a few orchards. These are expected to be eliminated shortly. The urbanization of the past 15 years in this subarea replaced range, small grains, grapes, hops, and fruit and nuts, including almonds, walnuts, and olives. Except for the hops and some orchards along the American River and a few spotted areas, the orchards and grapes were located on hardpan soil and soon would have gone out of production anyway.

Mather Subarea

Before Mather Air Force Base and Aerojet General Corporation were located in Mather subarea, it was mainly rangeland with some small grain operations. Now it is almost completely urbanized with industry. There are some small grain operations left in the eastern part, and they may stay in operation for the next generation.

Folsom Subarea

Range operations dominate agriculture in the Folsom subarea. There has been some urban takeover of land near the City of Folsom for residential purposes, and some of the land is being used by large aerospace corporations. If the County-Line Reservoir is built, the southern part of the subarea will probably be used for recreational and residential purposes.

Sheldon Subarea

In 1930 the Sheldon subarea was mainly rangeland, although there was

substantial acreage in grapes, small grains, and hops, and some acreage in row crops. By 1961 the grapes were just about wiped out, and most of the range was converted to irrigated pasture. Urbanization is just starting to take over land, but it should not take long to spread if an adequate water supply is found.

The Cosumnes River is the boundary between the Sheldon and Clay subareas. Along its flood plain are some of the prime agricultural soils in the county; these are used for hops, orchards, and row crops. This river belt of prime soils continues through the Elk Grove and Galt subareas where row crops are predominate. The whole river belt is zoned as a permanent agricultural area. With flooding problems and high agricultural returns, urbanization will be delayed in any case, but urban use of adjacent land will probably cause some problems in farming practices.

Clay Subarea

The western part of the Clay subarea has small grain and irrigated pasture operations. In 1930 there were some orchards and grapes, but they have almost disappeared. The eastern part is range on rolling land; there is a lack of ground water which restricts agriculture and possibly will limit future urbanization. Urbanization probably will not come until the rest of the county is approaching saturation and there are heavy pressures for more land.

Elk Grove Subarea

Changes in Elk Grove were similar to those in Sheldon. The grapes and orchards that existed in 1930 did not survive the competition because of hardpan soils. By 1961, except for row crops along the Cosumnes, and scattered grain and range, the Elk Grove subarea was mainly irrigated pasture. Urbanization has begun in the northern part of the subarea, and is expected to proceed south at a fairly rapid rate. A major sewer line is under construction which will help spread urbanization, but a drainage canal is necessary before the western side can be developed fully.

Galt Subarea

The small grain areas in the Galt subarea of 1930 have been converted into irrigated pasture and row crops along the Cosumnes River. Some rangeland

still exists. The City of Galt is growing rapidly, but it is not expected to join the Sacramento urbanized area until after the Elk Grove subarea is urbanized.

Delta Subarea

The Delta subarea is mainly Class I land except for the northeastern portion, which is now in dry and irrigated pasture. Both in 1930 and 1961 row crop and orchard operations were very productive. The changes have been mainly in commodities. There are more pears now and less other fruit, and more tomatoes and corn and less asparagus. The nitrogen and moisture levels of the soil are high, making corn and milo profitable operations. This subarea is expected to remain in agriculture.

Land in Agriculture Related to Distance from the City of Sacramento

In the preceding analysis in which the urban effects on agricultural enterprises were discussed by subareas, some of the locational information was derived from aerial photos. In this section aerial photos taken in 1953 and 1957 are used to relate the amount of land in agriculture with the distance from the Capitol Building in downtown Sacramento, without regard to subareas. Land not in agriculture is either in urban use or idle.

Table 14 shows the changes in Sacramento County's agricultural land area between 1953-57 within 26 miles of the city. This area is about 85 percent of the total area in the county. The change in agricultural land between 1953-57 did not decrease uniformly with distance from the city. If urban growth were to proceed in an orderly manner in relation to the city, then there should be a greater percentage decrease in agricultural land near the city than at a distance. This relationship is plotted on Figure 8 so the irregular urban growth is more apparent.

Agricultural land as a percent of total land is related to distance from the center of Sacramento for both 1953 and 1957 in Figure 9. A greater percentage of land was in agriculture in 1957 than in 1953 within 2-4 miles from the city. This may indicate that farm land was idle in 1953 on the expectation of urban use, but that the land was brought back into agricultural production because of delays in conversion to urban use. Idle land also was

TABLE 14

Estimated Changes of Land Area in Agricultural Use 1953-57 within 26 Miles of the City of Sacramento, Sacramento County Only

Distance from the center of Sacramento	Total land area included	1953 agricultural land	1957 agricultural land	Change in agricultural land	Change as a percent of 1953 agricultural land
	square miles				
4 - 5.9	48.5	30.4	21.4	- 9.0	29.4
6 - 7.9	55.8	40.1	37.6	- 2.5	6.2
8 - 9.9	85.2	72.9	66.7	- 6.2	8.5
10 - 11.9	70.3	63.7	53.9	- 9.8	15.4
12 - 13.9	70.5	59.7	52.8	- 6.9	11.6
14 - 15.9	75.9	62.4	57.2	- 5.2	8.2
16 - 17.9	90.7	79.5	69.3	- 10.2	12.9
18 - 19.9	103.3	94.1	84.7	- 9.4	10.0
20 - 21.9	95.0	91.2	86.3	- 4.9	5.3
22 - 23.9	83.5	79.1	77.2	- 1.9	2.5
24 - 25.9	58.7	56.7	56.0	- 0.7	1.1
TOTAL	837.4	729.8	663.1	- 66.7	9.14

Source: Aerial photos.

FIGURE 8

Percent Change in Agricultural Land Between 1953 and 1957
Related to Distance from Center of Sacramento
(Sacramento County Only)

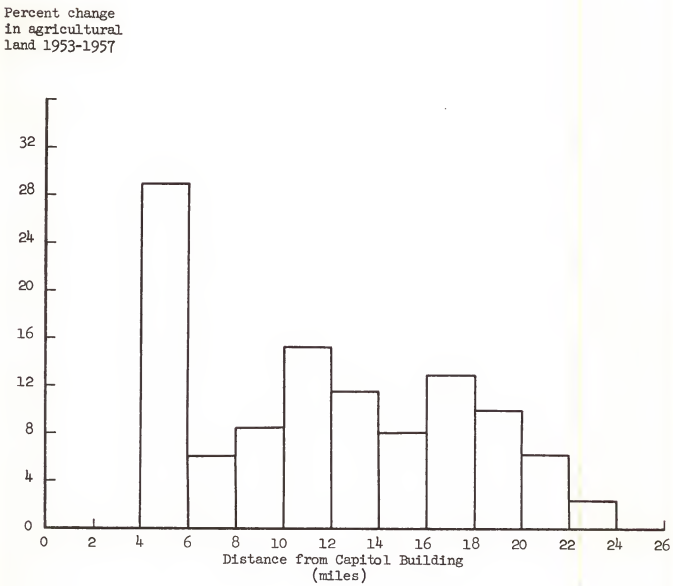
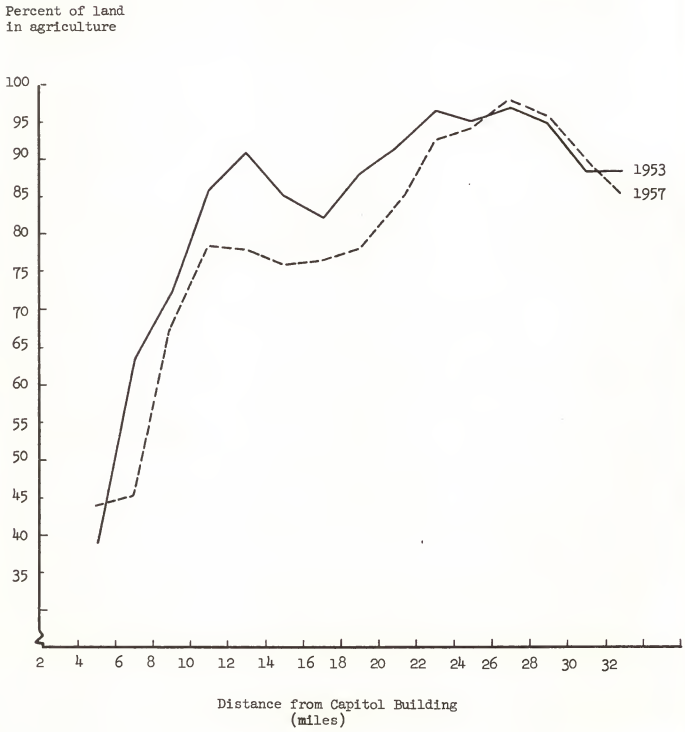


FIGURE 9

Percent of Land in Agriculture by Distance from Center of Sacramento
(Sacramento County Only)



brought into production between 1953-57 at a distance of 24-30 miles from the city. This represents reclamation of land through flood control practices in the Delta subarea, and a possible relocation of farms pushed out of urban areas.

Extensive Versus Intensive Use of Land

In the first part of this paper it was pointed out that about twice as much land was withdrawn for urban use in the Sacramento urbanized area than was actually developed. Observations of this nature usually lead to the general conclusion that growth of urban areas causes extensive use of farm land. However, it was pointed out also that most of the shifts in agricultural enterprise combinations in Sacramento County have been toward crops that use land more intensively. To determine the effects of urbanization on the intensity of land use it is necessary to examine (1) what happens as a result of the threat of physical take-over of agricultural land for urban uses and (2) the effects of increased demand for agricultural products.

The effects of approaching physical take-over.--As the urban area approaches particular parcels of farm land, the intensity with which the land is used varies considerably. It appears that changes in intensity depend largely on the quality of the soil and the type of owner, and the latter depends on the former to some extent. In general, in Sacramento County, it seems that the poorer the soil quality, the more extensive farming becomes, and the greater the chance that land will be held by a speculator instead of a farmer.

When sewers are available the poorly drained hardpan lands in Sacramento are as suitable for urban purposes as the well-drained Class I soil, but the agricultural net returns per acre on the hardpan lands are relatively low. If the farmer retains ownership of the land he becomes a speculator in that by retaining ownership he has the opportunity to reap a larger capital gain in the future. When the expected time of land conversion to urban use is short, the farmer is unwilling to make the capital investments necessary to maintain long-run agricultural net returns on the land. This lack of capital outlay forces farming to become more extensive.

Quite often, on the hardpan lands, ownership changes sometime prior to actual urban development. As the value of land increases with increasing proximity of subdivisions, tax increases wipe out or reduce net returns--"forcing" the farmer to sell. Owners who are not farmers find the potential rent in these circumstances too low to affect materially holding costs, and they do not want restrictive rental arrangements to reduce their chances of putting the land to immediate urban use.

Thus hardpan land is often idled or used extensively. The San Juan subarea is a case in point, where the idle land is about equal to the developed land. The same pattern is developing in the Elk Grove and Sheldon subareas, which also contain hardpan soils.

On good quality soils the story is different. Here farmers have sufficient returns to withstand the onslaught of increased taxes, and have the ability to hold out for large capital gains. This land is not likely to fall into the hands of speculators prior to development. In Sacramento County some of these Class I lands are surrounded by urban development. These parcels are located along the American River and in the "pocket" of the Sacramento subarea (southern part).

The intensity of land use on the good quality soils is different than on the poor soils. Quality land is not likely to be idled, and in some respects, it is used more intensively than before. With respect to long-term capital items, it appears that farming becomes more extensive. Items are not replaced and buildings and fences are not kept in good condition. But with respect to short-term capital items and labor, it appears that land use may become more intensive. Tractors and other field equipment already owned are consumed at a faster rate, rotation patterns are not followed, and more labor is used. In other words, the whole farming operation is geared to obtaining maximum short-run profits without regard to the impact of this policy on long-run profits without regard to the impact of this policy on long-run profits, since there is no long-run farming situation.

When farms are operated adjacent to residential areas there are some involuntary changes in operating practices. Farmers are restricted in the use of sprays and in the method of applying them. Greater expenses are incurred to prevent odors and flies. Vandalism increases. Labor may become

more expensive. Eventually, farm service firms may move to less accessible locations.

The effects of increased demand.--There has been notable increases in the production of beef, milk, eggs, corn, grain sorghum, tomatoes, rice, and pears over the last 10-15 years in Sacramento County. Increases in some commodities, particularly milk, are a direct result of the increased demand of the local Sacramento market. Fresh milk, and to some extent eggs, cannot be transported cheaply over long distances; therefore, they are produced near their markets. The same is true for meat, although perhaps to a lesser degree. The increase in beef production has been largely in drylot operations. The increase in corn and sorghum is complimentary to increases in beef, milk, and egg production.

Urbanization causes both more intensive and more extensive land use. To date, it appears that the net effect in Sacramento County has been for the intensity to increase. The same appears true for most other urbanized counties in the State. Statistics on intensity in Sacramento County, as well as other statistics, are compared with those at other counties in the next section.

General Changes in Sacramento County's Agriculture Compared with Other Counties

The changes in many of the agricultural statistics for Sacramento County do not appear significantly different from the average for all urbanizing counties in the State. As might be expected, urbanizing counties, however, changed differently than the rest of the State (Table 15).

The total number of farms in Sacramento County between 1950-59 fell by about the same proportion as in all Standard Metropolitan Statistical Area counties (SMSA's). The change in non-SMSA counties was not as great.

Commercial farms, as defined by the Census, remained at about 60 percent of all farms, although in other SMSA's the percent of commercial farms changed from 71 to 68 percent. The early settlement patterns of small parcels in areas such as the North Sacramento poultry district, and ample supplemental employment probably explain this lower proportion of commercial farms in

TABLE 15

Comparison of Changes in Agriculture in Sacramento County with the Average for Urban and Nonurban Counties in California, 1950-59

	Percentage change 1950-59			
	Sacramento county	Urban counties[a]	Other counties	State
Number of farms	- 37.0	- 35.7	- 18.5	- 27.6
Number of commercial farms	- 35.7	- 38.8	- 25.6	- 32.5
Number of farms with nonfarm income exceeding value of farm products sold	- 25.5	- 25.0	3.5	- 12.7
Land in farms	- 1.7	1.7	0.2	0.8
Cropland harvested	- 8.0	- 2.4	3.2	0.8
Irrigated land	29.2	14.6	15.0	14.9
Average acreage of farms	56.0	58.1	22.9	39.2
Value of land and buildings per acre	93.6	77.1	90.0	82.4
Value of products sold per acre	56.5	53.5	68.5	60.7
Value of products sold	53.8	56.0	68.8	62.0
Field crops	47.3	58.5	59.8	59.2
Vegetables	19.8	46.3	50.7	48.5
Fruits and nuts	59.7	42.8	98.6	65.7
Poultry	- 20.0	31.9	16.8	24.9
Dairy	58.2	52.1	41.4	47.5
Livestock, other than dairy and poultry	173.5	87.4	106.9	97.3

a/ Counties in Standard Metropolitan Statistical Areas (see Table 1).

Source: Computed from data given by the U.S. Bureau of the Census, Agricultural Census, 1950 and 1959.

Sacramento County. The difference in trends may be due to differences in the pattern of consolidation and in new land development for agricultural use.

In Sacramento County, there was a decline in the number of farms whose operators had other income which exceeded the gross value of farm products sold. Obviously, most of these farms were relatively small or were operated at very low intensity. The decline in the number of such farms was less than the decline of all farms. This is consistent with such farms being primarily rural residences for persons with urban jobs. Sacramento farms of this type are a slightly higher percentage of all farms than are those in other SMSA's, but they decreased in number by the same proportion. As might be expected, such farms are less frequent in non-SMSA counties, but in these counties not only did the small farms increase as a proportion of all farms but actually expanded their absolute number by 3.5 percent between 1949-59.

The decline in the total number of Sacramento farms is associated with changes in farm size, since total land in farms did not change much. If the amount of land in farms in 1959 (546,988 acres) were operated in units of the average size in 1950 (149.2 acres), there would have been some 3,660 farms instead of the 2,351 actual units. The increase in farm size was nationwide and represents the trend toward larger economic units. It is doubtful that this change was caused directly by urban growth in Sacramento, although there could be a relation between urbanization and consolidation.

On the average, it appears that farm consolidation and the development of new land have taken place simultaneously in substantial amounts in urban counties. Data for all SMSA counties in 1959 actually show a net rise of 1.7 percent over 1949 in the amount of land in farms. In Sacramento County there was a net loss of 1.7 percent, or almost 10,000 acres. The amount of new farm land developed is not known precisely, but it was not large. In any case, there was little land available for development into new farm land in 1949 compared to the SMSA counties such as Fresno, Riverside, San Bernardino, and Kern, which brought in hundreds of thousands of acres of new land. Sacramento stands midway between these and those that experienced very large net losses, such as Los Angeles, Contra Costa, Orange, San Diego, and Santa Clara. A review of the land resources of the county indicates that further urban growth will be even less likely to be offset by new land development than in the past. Flood control activities, in particular, have developed almost all that is feasible. Increased intensity of use can be expected, however.

Extending irrigation is an obvious means of making existing acres produce more, offsetting losses of land to urban growth. In the decade under examination, the rise in irrigated land in Sacramento was much greater than the rise for the average of all counties. In 1949, 24 percent of land in farms was irrigated; in 1959 it was 31 percent.

While irrigated land increased by 40,000 acres in the Sacramento County, total cropland harvested fell by 15,600 acres, or some 8 percent. This was a greater drop than the average drop of all urban counties. Cropland expanded slightly for the state as a whole. Some of the cropland went into urban use, and some was idled or shifted to grazing because of urban growth, but part of the cropland decline represents other adjustments in land use. Grain had been planted on some land unsuited for it during the war and postwar period. It was returned to grass either voluntarily or under the inducement of the Federal Soil Bank program. The relative profitability of irrigated pasture as a use for the hardpan soils of the county became more apparent during this period.

As a rule, urban growth in California can be expected to take more cropland than other land in farms, but this is less the case in Sacramento than in other areas.[1/] Usually the physical characteristics that make good cropland also lead to lower costs of urban development. Flat, well-drained soils are preferred for subdivisions. In Sacramento many of the better soils around the city have been subject to flooding, although this has been substantially corrected in recent years. More significant is the fact that much of the best agricultural land is some distance from the city center; also, the adjacent flat or gently rolling hardpan areas apparently are not materially more expensive to develop once sewage facilities are available. Thus, special circumstances have reduced the loss of actual cropland below the average loss in urbanized counties. Harvested acreage is a third of all land in farms in the county. It is estimated that perhaps less than half of the land removed from agriculture in the 1950-60 decade would be harvested cropland today had urban growth not taken place. Obviously, this is highly conjectural. Most of this land would be along the American River and in the area to the northwest of the city.

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1/ California Soil and Water Conservation Needs Inventory, The California Conservation Needs Committee, November 1961, p. 23.

While cropland has been removed from agricultural use, farmers in the county have been successful in increasing their output to make up for it. The value of farm products sold rose 54 percent from 1949-59--a little different from the average for all urban counties, but less than the 62 percent rise for the State. Approximately half of this increase was from beef production. Substantial increases also occurred from the expansion of field crops such as corn, safflower, rice, and sugar beets.

Products sold per acre of land in farms rose from $65 to $99, a rise of 57 percent. This was more than the 54 percent for all urban counties, but much less than the 63 percent increase for nonurban counties.

This increase in intensity of use resulted from higher investments in land and buildings, expanded use of other inputs, and shifts to more intensive enterprises. But the change in the value of land and buildings, as estimated by their owners in the censuses of 1949 and 1959, also is a result of the effects of urban growth. While products sold per acre rose 57 percent, value of farm land and buildings rose 94 percent. This amounted to a $5.42 increase in value of real estate for every $1 rise in annual output per acre. This rise was above the average for all urban counties and for the State as a whole.

To summarize this section, Sacramento County stands midway in the ranks of urban counties of the State in terms of land lost to urban uses and its effect on farm output. About half of the urban counties increased their agricultural output with greater reliance on development of new land. Sacramento agriculture was more successful in offsetting land losses through increases in intensity of use than the remaining urban counties. This was partly because it experienced less total loss of land. However, the value of farm real estate in Sacramento County went up faster than in other urban counties, which is consistent with its more rapid rate of urbanization.

CONCLUDING REMARKS

The direct physical take-over of agricultural land for urban use has played a major role, but not the dominant role, in causing changes in the relative position of enterprises in Sacramento County. So far, the physical take-over has decreased the acreage of walnuts, almonds, olives, small grains,

dry pasture, and hops. The contribution of these acres to total value of products sold has been minor. If they were all in production in 1961, the value of total output probably would have been only 2-3 percent higher. The hop acreage was the most serious single loss (about half in terms of value), but there are questions as to how long hops would have remained in production without urbanization, in face of competition from other sections of the country.

The stimulating effects of urban growth on output have more than offset the loss from direct physical take-over. The growing population has created a growing local market. The demand of these people has stimulated the dairy industry, enabling irrigated pasture to replace the less profitable small grains and row crops on hardpan soil. The demand has stimulated drylot feeding of beef cattle. The beef and dairy operations have stimulated the profitable corn and grain sorghum enterprises. Thus the increased demand of the urban population has created a shift to more intensive enterprises, making the value of total output higher than it would have been. Not only is the growth of the Sacramento urban market involved, other urban areas in the State and elsewhere helped create this increased demand.

What about the future? The Sacramento urbanized area will continue to grow. In its path within the next 20-30 years are two-thirds to three-fourths of the dairy operations with irrigated pasture, from one-half to two-thirds of the remaining small grain enterprises, a few scattered orchards, from one-eighth to one-fifth of the row crop acreage, about two-thirds to three-fourths of the rice land, and most of the present poultry operations.

If these operations and their land areas were eliminated overnight, the drop in gross farm income would be about one-third. But urbanization does not take place overnight; therefore, there will be time for adjustments. The dairy industry will become concentrated into one or several small areas, utilizing drylot feeding; there will be a possible relocation from the Elk Grove and Galt subareas to the Delta and Clay subareas. The poultry industry will relocate from the North Sacramento subarea possibly to the Clay subarea. Some of the row crops and rice in the Natomas subarea will probably relocate in the Delta subarea, forcing out less profitable operations. The small grain acreage probably will not relocate to any extent, especially in view of prospective lower prices due to national support programs.

With these relocations, the loss of agricultural gross income due to direct physical take-over of agricultural land would not be as great as one-third; it likely would be about one-sixth lower than otherwise. This does not mean that gross income will be lower in 20 years than it is now, even when expressed in constant prices. Gross income is likely to increase as enterprises become more intensive and as technology and productivity increase. Indeed the increases in agricultural output from shifts in enterprises due to the growing local population may more than offset the losses associated with the direct physical take-over of land.

In light of the future urban growth, Sacramento County is fortunate with respect to the juxtaposition of hardpan soils and the urban center, and to the overlay of flood areas with Class I soils. The urban growth will take over the poorer revenue-producing hardpan lands, and most of the high-revenue-producing lands will be protected from urban encroachment because they are subject to flooding. Moreover, the flood season usually does not interfere with the agricultural operations; and even if the floods were controlled in the future, parts of the Delta have peat soils which are unsuitable for houses. Each square yard of asphalt added to the north, east, or south of the city makes flood control of the Delta more difficult. Thus the Delta subarea is relatively safe from urban use, and it is the richest agricultural section of the county.

Presently about one-half of the value of output for the county comes from the Delta subarea and another one-sixth from other areas not likely to be urbanized. It seems reasonable to expect the past trend of increasing intensity to continue on these lands. For some time to come this will offset the losses in output due to the direct physical take-over by urban growth.

The conclusion that the net effects of urban growth have been to increase the agricultural output of Sacramento County, and will continue to do so for some time, should not be taken as a general conclusion applying to urbanizing counties. Each county would have to be investigated separately. In some counties, such as Los Angeles, Contra Costa, Orange, San Diego, and Santa Clara, prime agricultural land has been urbanized or is in the path of urbanization. In other counties, such as Fresno, San Bernardino, and Kern, urbanization is partially responsible, if only indirectly, for the reclamation of large tracts of good quality land.

Here benefits and losses have been discussed in terms of a particular county's agricultural gross income as affected by the urbanization of that county. This is a limited outlook, since urbanization and economic areas are not restricted by political boundaries. This approach does not consider changes outside of the county. It is quite possible, for example, that the urban growth in one county may have beneficial effects on agriculture in adjacent counties, or in the state as a whole, even though agricultural income is adversely affected in the urbanizing county. It is hard to visualize the greatness of California's agriculture today without the large and rapidly growing population.

Beneficial effects of urbanization are no excuse, however, for uneconomical use of land. Presently, in Sacramento County, about twice as much land is withdrawn for urban use than is actually developed. If this rate of sprawl continues, all of the expected potential urban land in the county will be withdrawn from agriculture in 30-40 years. The nonpotential urban land includes the Delta subarea and other sections of the county where the possibility of floods or soil characteristics would make urban development difficult.

If maximum benefit for the county is to be obtained from both agricultural and urban use of land, then the agricultural use should not be eliminated any sooner than necessary. Urban development should be as orderly as possible, and land use should follow well-designed plans that prevent sprawl and preserve the best quality soils in agriculture as long as possible. If there are no particular site advantages for urban use when the choice is between poor and good soils for agriculture, then the poor soil site should be developed first. Premature elimination of agricultural land, no matter how poor the soil, involves some sacrifice of total possible income. Not only is the income from the land itself less, but income generated by the processing and handling of the agricultural products is less. The total generated income could be 1.5-3.0 times the farm income, depending on the product.

Disorderly urban growth can cause speculation, and thereby create land prices that are out of line with the rate of conversion of land from agricultural to urban use. The prices in turn affect the assessments and taxes. The increased tax burdens and the land prices themselves can tend to idle land or change the agricultural practices. The effects of urbanization on prices and taxes of agricultural land are the subject of the next report.

Overall Results

The independent variables explain 41 (equation 2) to 45 (equation 3) percent of the variation in sales price per acre. This level of explanation indicates omission of other relevant variables but is consistent with what would be expected in a highly speculative market in the rural-urban fringe. There was wide variation in land prices. The average price was $1,196 per acre, yet about one-sixth of the parcels sold for over $2,000 and about one-sixth sold for less than $400 per acre.1/

These extreme sales represent both realistic and unrealistic views of future returns. That is, the extreme high or low price in some transactions results from rational decisions with price akin to value, while in other transactions it seems that price is not equal to value. In neither case can this variation be explained by quantifiable variables in a statistical model. The reasons for the realistic extremes differ from transaction to transaction and, of course, the unrealistic extremes cannot be explained.

An analysis of the transactions which resulted in extreme contract prices revealed some of the reasons for the extremes. Some of the

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1/ The average prices in Northern Santa Clara County in December 1952, as reported by Lessinger, op. cit., were approximately the same level as those in Sacramento County in 1959-60. The following comparison shows the rise in prices by development area in Santa Clara County between December 1952 and March 1962. The 1962 prices were obtained from consultation with personnel in the county assessor's office.

Area	1952	1962
I 1	$4,300	$19,000-21,000
I 2	2,900	12,000-13,000
I 3	2,600	10,000-15,000
O	1,900	8,500-10,000
C	1,600	7,500-10,000
D	900	5,000- 6,000

Land use intensity of parcel at time of sale:

Z_1' = vacant

Z_2' = dry pasture

Z_3' = irrigated pasture, grain, alfalfa

Z_4' = fruits and vegetables (row crops, orchards, rice)

Z_5' = rural homesites

Corner lot:

Z_6 = yes

Z_7 = no

Percent down payment:

Z_8 = greater than 30 percent

Z_9 = equal to or less than 30 percent

The squared terms of the independent variables X_2, X_3, X_4, and X_5 were entered into the equations (Table 1). The coefficients for X_3^2 and X_7^2, however, were not significantly different from zero at the .05 level. The reliability of the data grouping by type of general agricultural area in explaining price variation is not very great. Each of the coefficients for the dummy variables Z_2 through Z_5 were not significant at the .05 level. Similarly, the alternative grouping of sales by land use (Z_1' through Z_5') were unreliable estimators.

Data on the percentage down payment were available only for 187 observations, rather than for 223. The effect of a down payment greater than 30 percent is shown by Z_8 in equation 3. Variable Z_6 in equation 3 shows the effect of the location of a parcel on the corner of two roads. The coefficients for both Z_6 and Z_8 were significantly different from zero at the .05 level, but there was not much improvement in explaining total price variation with equation 3 as compared with equations 1 and 2.

TABLE 1

Coefficients of the Regression Equations Used to Explain Variation in the Price of Land per Acre in Sacramento County a/

Equation number	Coefficient of determination R^2	Constant term	Date of sale X_1	Distance from center of city X_2	Distance from center of city X_2^2	Distance from highway X_3	Distance from highway X_3^2	Soil rating (Storie Index) X_4	Soil rating (Storie Index) X_4^2	Number of acres in parcel X_5	Number of acres in parcel X_5^2
1	.42	560.32	14.18 (6.28)	-169.42 (71.46)	3.49 b/ (2.15)	-235.56 (67.54)	15.34 (8.07)	90.12 (42.43)	-0.83 (0.44)	-1.04 (0.44)	0.00016 c/ (0.00023)
2	.41	132.62	13.56 (6.29)	-156.01 (63.51)	3.07 b/ (1.91)	-280.48 (64.53)	20.33 (7.73)	103.29 (41.66)	-0.93 (0.42)	-0.82 (0.21)	--
3	.45	388.27	14.64 (7.11)	-156.42 (71.30)	3.27 b/ (2.17)	-207.36 (72.16)	14.04 (8.30)	93.77 (45.61)	-0.89 (0.46)	-0.97 (0.30)	-0.00380 c/ (0.02966)

Equation number	Type of general agricultural area in which parcel is located: Range Z_1	Irrigated pasture Z_2	Mixed Z_3	Grain Z_4	Row crops, rice, and orchards Z_5	Land-use intensity of parcel at time of sale: Vacant Z_1'	Dry pasture Z_2'	Irrigated pasture Z_3'	Fruits and vegetables Z_4'	Rural homesites Z_5'	Corner lot: Yes Z_6	Corner lot: No Z_7	Percent down payment: >30 Z_8	Percent down payment: <30 Z_9
1	[-222.72]	-6.75 c/ (58.65)	-18.31 c/ (97.80)	213.38 b/ (136.01)	-94.61 c/ (146.08)									
2						37.95 c/ (72.13)	3.40 c/ (98.66)	-25.04 c/ (69.54)	70.95 c/ (207.55)	[-127.04]				
3											845.80 (237.81)	[0-]	-258.65 (117.59)	[0-]

a/ Numbers in parentheses under the coefficients are the standard errors. The dummy variable coefficients in brackets were not computed as part of the equation, but they are interpreted in the same way. The sample size was 223 in equations 1 and 2 and 187 in equation 3.

b/ Significant at the .10 level, but not significant at the .05 level.

c/ Not significant at the .10 level.

Dummy variables:[1/]

Type of general agricultural area in which parcel is located (Figure 2):

Z_1 = range

Z_2 = irrigated pasture

Z_3 = irrigated pasture mixed with some more intensive crop

Z_4 = grain

Z_5 = row crops, rice, orchards

1/ Dummy variables are used to handle qualitative variables for which the variation is only between discrete groups. See Suits, Daniel B., "Use of Dummy Variables in Regression Equations," Journal of the American Statistical Association, Vol. 52, No. 280, December 1957. The number of dummy variables used in the regression equation is one less than the number of groups for each effect that is being measured. There are four different effects expressed with dummy variables here and the four groups not used in the equations are Z_1, Z_5, Z_7, and Z_9.

Two different methods of assigning values to the dummy variables were used, and there is slight difference in the interpretation of the results. In equation 3, Table 1, the values for the observations are either 0 or 1. For example, if a parcel of land was located on a corner lot it was assigned a value of 1 in Z_6; if it was not a corner it was assigned a value of 0. In using the equation, if the parcel for which the price is being predicted is on a corner lot then the coefficient of Z_6 is added to the constant term of equation; if it is not on a corner lot, then the constant term is used as it is, i.e., the coefficient for Z_7 is zero. Thus, the equation for corner lots is higher and parallel to the one without corner lots.

In equations 1 and 2 the values assigned to the observations for each dummy variable were either 1 or a negative number that made the sum of the observations of each dummy variable equal to zero. Using this method it was necessary to compute coefficients for the excluded variables after the other coefficients were derived. These are bracketed in Table 1. Variables Z_1 through Z_5 were set up to show the influence of the type of agricultural area on price variation. The excluded group was Z_1. If a sale is in a range area, the coefficient for Z_1 is added to the constant term, instead of using the constant as it is. The formula for deriving the coefficient for the excluded variable, b_e, is:

$$n_e b_e = - \sum_{i=1}^{k} n_i b_i$$

where n_i = number of observations falling into included group i, n_e = number of observations falling into the excluded group, b_i = coefficient of included group i, and k = number of included groups.

Thus, most of the sales involved land with hardpan soils on which the agricultural returns were relatively low.

Data on prices are for parcels of land, some of which include buildings and other improvements. Nonresidential improvements are included in the price since there is no way to separate the price paid for the improvements and the price paid for the land. In some studies this would be a shortcoming, but here it is not a problem. In fact, it could be argued that the improvement value should be included, since most buyers were nonfarmers and the farm buildings will be razed when the land is converted to urban use. Thus, the farm improvements had no value to the buyers in most cases.

The Models

The following independent variables were used in regression models set up for the purpose of explaining the variation in price per acre. Regular variables:

X_1 = time of sale, measured by months (X_1 = 25 for January 1959)

X_2 = distance from center of city, measured in miles along roads to the Capitol Building

X_3 = distance from a major highway leading to the city, measured in miles along roads

X_4 = soil quality, using the Storie index[1/]

X_5 = acres in parcel

1/ The index relates various physical features of soil into a numerical scale that ranges from 0 to 100. Drainage characteristics, depth, amount of rock, slope, and similar features are considered. These features could be significant for urban use as well as agricultural use.

land market during this time can be described as highly speculative, which means that price variation can be large without a strong relation to value.

Land-sale activity in Sacramento County has followed a pattern that would be expected of a rapidly growing urban center. In the years 1953-58 such activity was concentrated in the San Juan subarea, due to the location of Aerojet General Corporation and the construction of the Roseville Freeway (Highway 40). By 1958 the San Juan subarea was well on its way to becoming urbanized and land-sale activity shifted to the southern part of the Sacramento subarea and to the Elk Grove subarea. In the 1958-61 period, construction was started on the last remaining link of the South Sacramento Freeway (Highway 99), and plans were underway for a lateral sewer line for the area south of the city.

Speculative land-sale activity precedes actual urban development and usually ends before urbanization is completed. After a point, most of the land is in the hands of those who actually are going to develop it and speculative activity slows down.

Of the 223 parcels of land in the sample 138 were classified as being actively used in agriculture and 85 were classified as vacant land. Most of these vacant land sales were sales by speculators to other speculators or developers[1/] -- meaning that on some previous change of ownership the land was taken out of agriculture and idled.

At the time of the sales only 14 of the land parcels were being used for intensive types of agriculture such as row crops, rice, and orchards. About 74 were being used for irrigated pasture or its equivalent. About 50 were being used for small grain and range operations.

1/ Information on the type of buyers and sellers was obtained from meetings with prominent farmers of the area.

Thus, if the seller of land cannot receive his full price in cash from the buyer, he can accept a down payment and sell the mortgage. But since the mortgage sells at a discount, the seller must increase the selling price of land (which increases the value of the mortgage) so that the down payment plus the receipts from the sale of the mortgage equal what he would have received from a cash buyer. The secondary mortgage market serves to establish an interest rate commensurable with the risk involved, so even if the seller retains the mortgage the higher selling price is necessary to compensate for the risk involved.

Statistical Analysis of Land Prices in Sacramento County

This section presents a statistical analysis of the relation between access characteristics and selling prices of land parcels. Independent variables representing measures of access characteristics are related to land prices to explain the variation in such prices.

Description of Sample

Data on sales of nonurban land were obtained from the assessor's office in Sacramento County. The observations used included only those for which sufficient information on the independent variables was available, and those whose sale price had been verified by the buyer or seller. Nonbona fide transactions, such as those that involved trades, gifts, and fathers and sons, were excluded. The sample contained 223 observations.

Of these sales, 200 occurred in 1959 and 1960 and the remainder in late 1958 and early 1961. Because speculative activity tends to be concentrated geographically, the location of the observations were not evenly distributed over the county. Instead they were concentrated in the Elk Grove subarea, which is south of the City of Sacramento. The

the problem of valuation are interested in establishing market values for real estate; yet, quite often they are forced, legally, to use unreliable indicators of values.

Cash Price vs. Selling Price

Not only can prices be different from values, but cash prices can be different from selling prices. Differences between cash prices and selling prices are possible in transactions in which credit is extended by the seller. When 100 percent cash is not received by the seller, the selling price of the land quite often is higher than it would be if 100 percent cash were paid. In other words, the selling price includes not only the price of the land *per se*, but also the price of credit. When this situation exists, as it does now in most land markets, selling prices are even a poorer expression of land values than indicated in the previous section.

Not too many years ago it was difficult to buy land on credit. Lending institutions required security and a large down payment. Now credit is relatively easy to obtain, and the seller often is willing to supply it.[1/] This willingness has come about partly because of the recent establishment of secondary mortgage markets where the seller can sell the mortgage note in order to obtain cash. The seller, however, does not receive the face value of the mortgage. The risk on land mortgages is too great to be compensated by the maximum legal interest rate that can be stated on the mortgage note. Discounts on mortgage notes vary with the "safety" of the mortgage, but often run as high as 50 percent.

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1/ Out of a sample of 91 sales in Sacramento County the down payment was less than 30 percent in 62 and less than 20 percent in 23.

said to be higher (or lower) than the value of the parcel. Here realistic expectations are those based on the best information available about future events and are usually some kind of average determined by group action (large number of well-informed buyers and sellers). Values determined in this way are market values. Individual values may not equal market prices; therefore, individual prices need not equal market values.

Expectations determined by group action are more likely to come true than those determined by individuals, since future events themselves are shaped and determined to some degree by expectations of a group. Land values, however determined, can have an effect, either directly or indirectly, on group decisions in the allocation of resources. Thus, values used or assigned by public officials should be group or market values, not individual values. If values were determined from information on single or few transactions, misallocation of resources could occur.

Prices of land, then, can differ widely from market values. These price variations are likely to be larger in the fringe area than in strictly urban or rural areas, because of the wide differences in agricultural and urban values and because prices in the fringe are based on the expectation of an additional variable -- the time of conversion from rural to urban use. Individual expectations of urban growth rates and directions vary widely, and prices are based on extreme expectations.

In the face of the imperfect land markets in the fringe and imperfect land markets in general, land prices often are a poor indicator of land values. Prices do not serve the function of establishing values in land markets as well as they do, for example, in the stock and commodity markets. Assessors and other public officials concerned with

use in each year. The access characteristics would determine the conversion probabilities of each land parcel or subarea for each year.

Values vs. Prices

Equation (1) would reflect the value under perfect knowledge of future events, and along with perfect competitive markets, prices would equal value. In the absence of perfect knowledge, but with active competitive markets, values are based on expectations of future events. Expectations vary from individual to individual; but with many participants in the market, average expectations prevail -- extremes are ruled out. Again, values would be synonymous with prices. The pricing in the market establishes values based on expectations, even though these expectations may turn out to be poor indicators of future events.

Land markets, however, are noted for not conforming to the model of pure competition. Land parcels available for sale cover a wide land area, there are not many buyers and sellers, many of the buyers and sellers are once-in-a-lifetime participants with lack of knowledge, and the frequency of sales is low. Under these conditions extremes are not ruled out. The meeting of one buyer and one seller can establish a price based on unrealistic expectations of future income and other events. Prices vary widely from sale to sale without any recognizable pattern, making explanations of the variation difficult. Thus, the lack of perfect knowledge leads to prices based on expectations, and the lack of competitive markets leads to expectations and prices that vary widely.

It is sometimes argued that since a parcel is sold, the price paid is the value: the value to the buyer (seller) is what he was willing to pay (receive). This can be called an individual value. In another sense, prices determined by unrealistic expectations can be

land,[1/] k = last year land will be used for agricultural purposes, n = last year land will be used for urban purposes, r_a = agricultural discount rate, and r_u = urban discount rate.

The fringe value would be somewhere between the agricultural and urban values that are based purely on a single use. The urban value is necessarily greater than the agricultural value since the fringe land would not have a potential urban use if the agricultural value were higher.

The net returns from both agricultural and urban uses are necessarily expected values. The first year of urban use and k, the last year of agricultural use, also are expected values. This is expressed as

$$(2) \qquad E(k) = \sum_{k=1}^{m} kp_k, \quad p_1 + p_2 + \ldots + p_m = 1$$

where p_k is the probability that the last year for agriculture will be in the kth year. The expected fringe value can be found by applying the probabilities directly to equation (1) as [2/]

$$(3) \qquad E(FV) = \sum_{k=1}^{m} FV_k p_k, \quad p_1 + p_2 + \ldots + p_m = 1.$$

The value of a parcel of land in the fringe is an expected value that depends on the annual expected net returns, the discount rates, and the probability of the parcel being converted from rural to urban

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1/ Because of difficulties involved in estimating annual urban returns to land, application of equation (1) might be easier in the form of

$$(1a) \qquad FV = \sum_{t=1}^{k} \frac{A_t}{(1 + r_a)^t} + \frac{UV}{(1 + r_u)^{k+1}}$$

where UV is the urban value estimated from current sale prices of land that is being converted immediately to urban use. This assumes that UV (in real terms) in t=k+1 is equal to UV in t=1.

2/ This assumes that A_t and U_t are independent of k.

optimize his return from the land, is weighing every present action in terms of its effect on the potential returns from alternative future uses. And one of these alternatives is to continue holding the land in its speculative use until capital gains can be maximized. Where rapid changes in access are anticipated, but not yet fully reflected in sale prices, such speculative use of land is indicated most obviously. Eventually, when future access change is not expected to raise values sufficiently to repay further speculation, urban uses are begun.

The period of speculation is determined by many things and it can be highly variable due to the personal circumstances of the present owners. The owners' expectations, alternatives, and preferences play key roles. This means that objective measures of access, such as distance from the center of Sacramento, at best will give only a partial explanation of changes in land prices that occur during a short period. This is illustrated in a later section.

The Theory of Land Value

The basis of land value is the stream of income that is forthcoming from use of the land. If the land is being used for agricultural purposes and will continue to be used for agricultural purposes, its value is the present value of future agricultural net returns to land. Similarly, if land is being used for urban purposes, its value is the present value of future urban net returns to land. The value of a parcel of land in the fringe area (FV) is the combined present values of both agriculture and urban future net returns since this land will convert from one use to another. This can be expressed as

$$(1) \qquad FV = \sum_{t=1}^{k} \frac{A_t}{(1 + r_a)^t} + \sum_{t=k+1}^{n} \frac{U_t}{(1 + r_u)^t}$$

where A = agricultural net returns to land, U = urban net returns to

It is defined as the nonurban or agricultural area around an urban center (Sacramento in this case) that is under the direct influence of the growth of the urban center.

The Theory of Land Values in the Rural-Urban Fringe

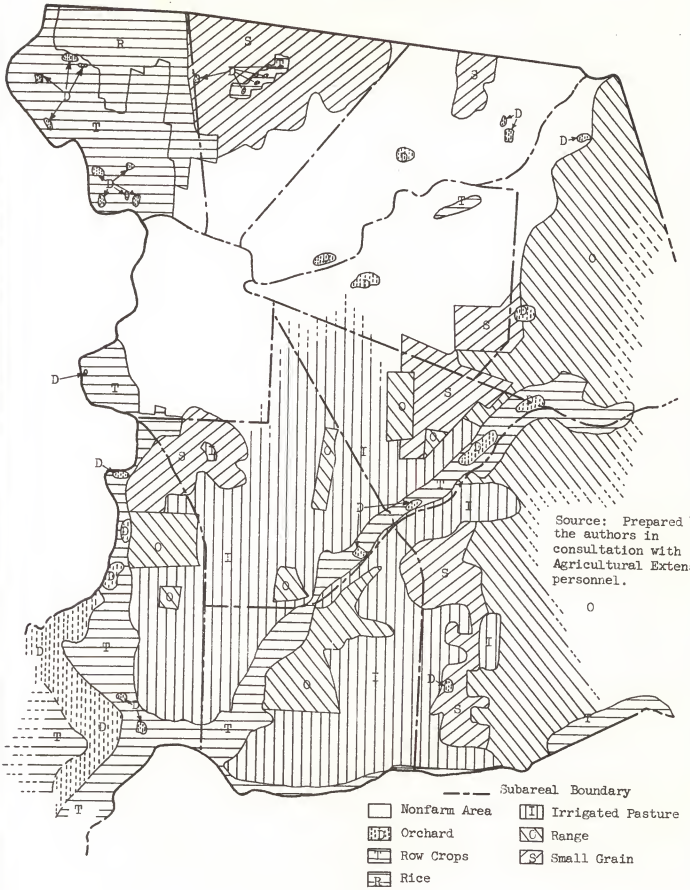
"Access" and Land Values

"Access" is defined as the sum of the characteristics that influence the location of urban activity. The access of a parcel is related to its income producing ability and therefore to land values. The greater the level of access of a particular subarea or parcel of land, the greater the value of the land. Any change in access is reflected in the timetable of future urban activity and thus in the value of the property. The components of access change and the many different urban land-use activities -- residential, commercial, industrial, public works, agricultural -- differ in their response to changes in the access mix. Basically, it is the way in which access characteristics affect the net returns of these activities that attracts them to one location over another. And it is the differences in net returns that can be ascribed to land that allows one use to outbid another for a given location.

Time has an important role in this process because land has a long income-earning life. Most uses of land require a substantial commitment of capital in improvements that also have a long life. Thus, any owner of land, or prospective purchaser, is concerned with expected future changes in access characteristics.

The process of shifting from agriculture to urban use is not instantaneous. Intermediate to the two uses is what might properly be called a speculative use of the land. The day-to-day agricultural activity still may be carried out; but the owner, if he is acting to

Figure 2. -- General Farming Areas in Sacramento County, 1961



because of floods and peat soils. The Clay subarea (except next to rivers) and parts of the Folsom and Galt subareas lack sufficient ground water for urban development. Thus, it is expected that other areas will be urbanized before conditions warrant the piping of water into these outer subareas.

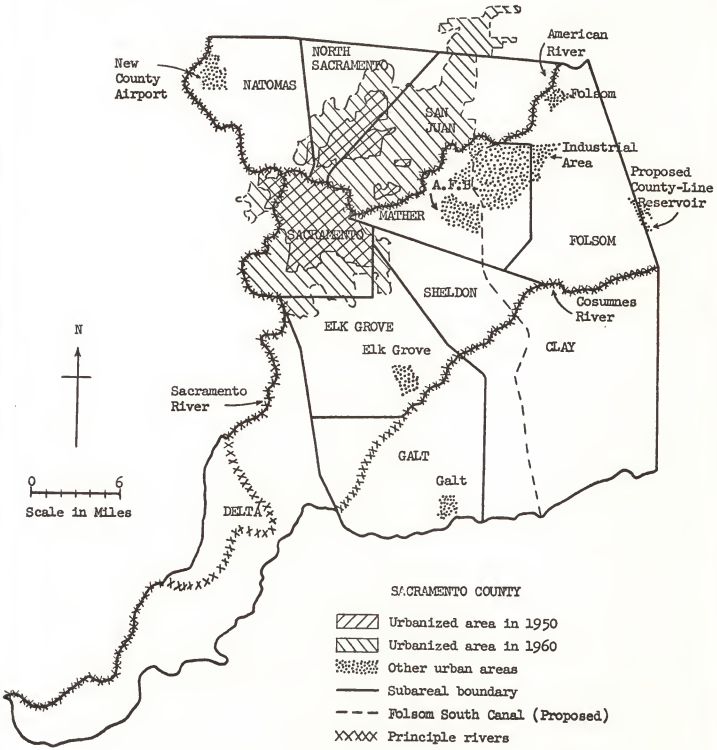
The effects on agriculture can be seen in Figure 2. Most of the future urban growth is expected to take over irrigated pasture and small grain lands, leaving the large bulk of orchards and row crops untouched. Increased urban demand probably will allow the farmers in the Delta and other areas unsuitable for urban use to increase their profits through more intensive use of their land.

PRICES OF AGRICULTURAL LAND

This section contains an appraisal of the relation between variation in land prices and variables that measure urban influence.[1/] The theoretical aspects are presented first, then the empirical work. The term "fringe area" (or rural-urban fringe) is used in this section.

1/ For other studies recognizing nonfarm influences on land prices and values see: Weeks, David, "The Impact on Farm Land Values of Increased Population," The Appraisal Journal, Vol. 19, Oct. 1951, pp. 479-497; Scofield, William H., "Prevailing Land Market Forces," Journal of Farm Economics, Vol. XXXIX, No. 5, Dec. 1957, pp. 1500-1510; Sargent, Frederic O., "Land Market and Price Analysis in an Agro-industrial Economy," The Appraisal Journal, Vol. 27, Oct. 1959, pp. 359-363; Ruttan, Vernon W., "The Impact of Local Population Pressure on Farm Real Estate Values in California," Land Economics, Vol. 37, May 1961, pp. 125-131; Lessinger, Jack, "A Theory of Rural-Urban Transition," Preliminary Draft, May 1, 1962; Tsagris, B. E., and Robert K. Coe, "Changing Pattern of Industrialization, Land Use, and Values: Sacramento Metropolitan Area, 1950-61," Real Estate Research Bureau, Sacramento State College, Published by State of California, Division of Real Estate, June 1962; and Scharlach, Wesley C., and Edward G. Schuh, "The Land Market as a Link Between the Rural and Urban Sectors of the Economy," Journal of Farm Economics, Vol. XLIV, No. 5, Dec. 1962, pp. 1406-1411.

Figure 1. -- The Sacramento Urbanized Area, 1950 and 1960 and Other Major Urban Areas, 1960



The additional population of recent years has settled in areas away from the city in low-density developments. The growth has been land-consuming. In 1950 the average density in the Sacramento urbanized area, as defined by the census, was 5,091 persons per square mile; in 1960 it was 3,373.

In 1960 the urban population used about 155 square miles of land out of the total 985. An additional 530 square miles are expected to be used for residential development in the future. If the 1960 rate of sprawl continues, all of this land will be withdrawn from agriculture by 1995. In 1960 about twice as much land had been withdrawn as was actually being used for urban purposes. To put it another way, without any change in the style of living in single dwellings, the projected population growth of 1975 could be settled on land that is already classified in the urban category.

Figure 1 shows the 1950 and 1960 Sacramento urbanized areas, as defined by the census, and other major urban areas. The county is divided into subareas that are relatively homogeneous with respect to expected urban development. That is, the boundaries, for the most part, are topographic features that serve as social and economic barriers, such as rivers and railroads. Most of the population increase between 1950 and 1960 settled in the Sacramento, San Juan, and North Sacramento subareas. It is projected that these subareas will continue to grow in the near future, and at the same time there will be increased urban activity in the Elk Grove, Sheldon, Mather, and Natomas subareas.

Fortunately for Sacramento's agriculture, most of the land that is in the direct path of urban expansion is hardpan soil from which the net returns are relatively low. The bulk of the best soil (Class I) is located in the Delta subarea, which is assumed unfit for urban use

URBANIZATION AND ITS EFFECTS ON AGRICULTURE IN SACRAMENTO COUNTY, CALIFORNIA

2. Prices and Taxes of Agricultural Land

by

Curtis C. Harris, Jr.[1] and David J. Allee[2]

INTRODUCTION

The first section of this paper is concerned with the effects of urbanization on prices of agricultural land. A theory of land values in the rural-urban fringe is presented and values are related to prices. Prices are analyzed with statistical models for the purpose of explaining the variation in prices.

The second section of this paper is concerned with the effects of urbanization on taxes of agricultural land. Problems of determining appraised values for tax purposes are discussed, taxes are related to urban sprawl, and data on the real estate tax base in Sacramento County are presented. Statistical analyses are made of taxes and assessments by subareas within the county, the relation between assessments and prices, and the relation between taxes and net returns to land and rents.

The first part of this two-part study on urbanization and its effects on agriculture in Sacramento County described the urban growth and related it to agricultural land use. The highlights of this first report briefly follow.

Between 1950 and 1960 the urban population (census definition) in Sacramento County increased from 207,230 to 426,531. The total county population projections are 830,000 for 1970 and 2,400,000 for 2000.

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FOREWORD

This paper is the second part of a two-part report on urbanization and its effects on agriculture in Sacramento County, California. It analyzes the effects of urbanization on prices and taxes of agricultural land. The first part described the urban growth and related it to agricultural land use. Although the results of the study in Sacramento County are reported in two parts, the subject matter in each part is independent of the other.

The authors wish to express their appreciation for the excellent cooperation received from the personnel of the County Assessor's office. Particular thanks go to Richard A. Blechschmidt, County Assessor, and William E. Rose, Supervising Rural Appraiser, for their aid in obtaining data on taxes and sales of agricultural land.

Special thanks also go to the farm advisors of Sacramento County and to A. Doyle Reed, Agricultural Extension Service, University of California. They supplied the cost and return data used in this study, aided in obtaining other data, and introduced us to prominent farmers in the county. The farm advisors, at the time the information was obtained, were: James Elings (Director), Glenn Goble, Thomas Kearney, Torrey Lyons, Woodrow Mitchell, and Gordon Morehead.

Although this report has benefited from the aid and suggestions of the above named individuals and many other people, the authors assume full responsibility for the results.

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2. Prices and Taxes of Agricultural Land

Curtis C. Harris, Jr., and David J. Allee

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extremely high prices came about because industrial- and commercial-site buyers were able and willing to pay premiums for good locations. (The property was worth more for industrial or commercial use than for residential use, and most of the sales in the sample were for potential residential sites.) Other sales on the high side involved sites next to golf courses, freeway interchanges, rivers, and cities.

Some of the sales on the extremely low side involved property which the owner was forced to sell because of pressing financial needs; others were for parcels located near an industry that emits unpleasant odors; and still others involved the completion of options in which the price was set several years previously. Generally, prices of land in which the buyer paid cash were lower than transactions involving some sort of credit.

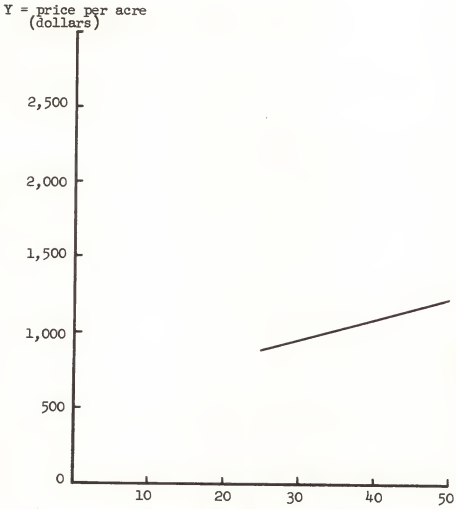
Reasons for many of the extreme sale prices could not be found. They apparently were based on an unrealistic outlook of the future created by the speculative activity in the area.

The Explanatory Variables

Date of sale.--Since the observations covered a period of slightly over two years and the market was highly speculative, the passage of time was an important variable explaining the variation in land prices per acre. Considering the full sample, the rate of increase due to the passage of time, with everything else held constant, was about $14 per month per acre (equation 1, Table 1). For the average-size parcel of 120 acres this amounted to an increase of about $40,000 over the two-year period (1959 and 1960) during which the bulk of the sales were made.

The average relationship between time and the expected price, using equation 1, is shown in Figure 3. It is the relationship for 120-acre parcels of land having a soil rating of 60, located in an

Figure 3. -- Expected Relation between Land Price and Month of Sale*



X_1 = month of sale
(30 = June 1959, 40 = April 1960, 50 = February 1961)

* Using equation 1 and the following values of other variables: $X_2 = 15$, $X_3 = 3$, $X_4 = 60$, $X_5 = 120$, $Z_2 = 1$.

irrigated pasture area 15 miles from the center of the city and 3 miles from a major highway leading into the city. (These values are close to the averages for the 223 observations.) For such parcels, for example, the line indicates that the expected price of land would have been about $1,025 per acre in December 1959.

Distance from the center of the City of Sacramento.--Ease of travel into the city center is a variable that directly reflects the access of a parcel of land, and thus is important in explaining variation in land prices. Generally, parcels located closer to the city have greater levels of access and higher prices.

There are several ways in which ease of travel into the city can be measured, such as the distance of a straight line between two points, distance along roads, and travel time. Travel time often is used to measure accessibility, since the time can vary for parcels located the same distance from the city but in different directions. Travel time, however, is affected by road conditions and the amount of congestion, and it is not a stable or long-run measure. It varies by the time of day and by the day of the week. It changes as road improvements change, as speed limits change, and as population changes.

Because of these shortcomings of travel-time measures, the distance in miles along roads, X_2, was used to measure accessibility of parcels. Distance along roads is a better measure of the relative long-run accessibility among parcels of land, although the effect of distance on land prices can change as other things change, such as total population. In any case, in Sacramento it did not appear that congestion was lopsided in any one direction. The side with the most people had the better roads.

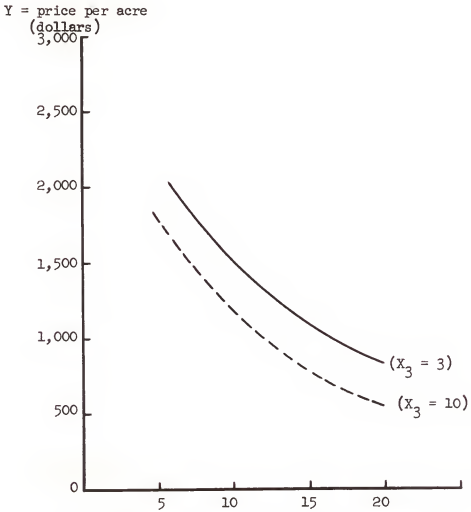
The relationship between distance from the City of Sacramento and the expected price is shown in Figure 4. Note that the price falls at a decreasing rate (within the relevant range of X_2) as the distance from the city becomes greater. This is due to the squared term for X_2 in the equation. The relations derived from equation 1 are for 120-acre parcels having a soil rating of 60, that sold in December 1959, and are located in an irrigated pasture area 3 or 10 miles from a major highway leading into the city. The solid line shows, for example, that the expected price of land 5 miles from the city is about $2,025 per acre; 20 miles from the city it is about $800. For land located 10 miles from a major highway ($X_3 = 10$) these prices are about $1,775 and $550 per acre, respectively.

Distance from a highway.--Another important measure of the access of a parcel is the distance from a major highway leading into the city center (X_3). Miles from a highway are related to the expected price in Figure 5, using equation 1. The relation is for 120-acre parcels having a soil rating of 60, that sold in December 1959, and are located 5, 10, or 15 miles from the city center in an irrigated pasture area.

Note the decrease in land prices as the parcels are located further from the highway. For parcels located 15 miles from the city center and adjacent to a highway the price per acre was about $1,575; for parcels 5 miles from the highway the expected price was about $800 per acre. There is a notable shift in this line when the distance from the city center changes. At 5 miles from the city center the expected price for parcels adjacent to a highway is about $2,575 per acre; at 10 miles the price is about $2,000 per acre.

Soil rating.--Soil quality is often a plus factor in urban development of land as well as in its agricultural use. Usually the better

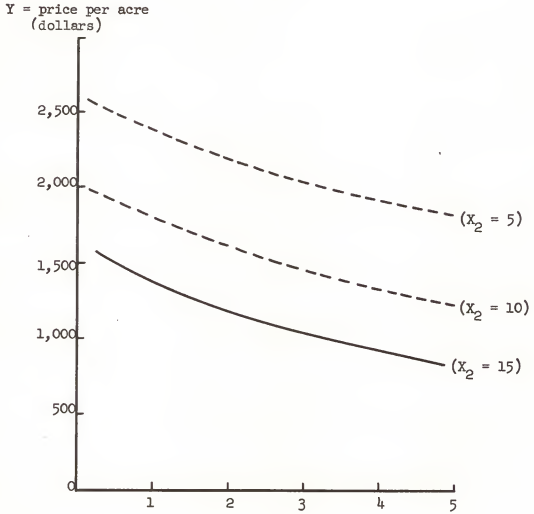
Figure 4. -- Expected Relations between the Land Price and Distance from the Center of the City of Sacramento*



X_2 = miles from center of the City of Sacramento.

* Using equation 1 and the following values of other variables: X_1 = 36, X_3 = 3 or 10, X_4 = 60, X_5 = 120, Z_2 = 1.

Figure 5. -- Expected Relations between Land Price and Distance from a Major Highway Leading to the City of Sacramento*



X_3 = miles from a major highway leading to the City of Sacramento.

* Using equation 1 and the following values of other variables: X_1 = 36, X_2 = 5, 10, or 15, X_4 = 60, X_5 = 120, Z_2 = 1.

quality of the soil, the less expensive it is to prepare the land for urban use. However, in Sacramento County, as was pointed out in the report on the effects of urbanization on land use, poor quality hardpan soils are as suitable for urban use as are good quality soils when sewage disposal facilities are installed. The Storie index (X_4) was used to analyze the influence of soil quality on price variation.

Relations between expected price and soil rating are illustrated in Figure 6. These are for 120-acre parcels located in an irrigated pasture area 15 miles from the city center and 3 miles from a major highway and which sold in December 1959. The line labeled "all buyers" is derived from equation 1. Its predominately downward slope is contrary to what might be expected, but it can be explained by the dominance of nonfarmer buyers in the sample (158 out of 223). When the data are separated by type of buyer, the shape of the curve is different for farmer buyers than that for nonfarmer buyers.1/

The unusual shape of these lines reflects the fact that the hardpan soils are as suitable for urban development as are higher rated soils, and the possibility that the soil quality index does not represent

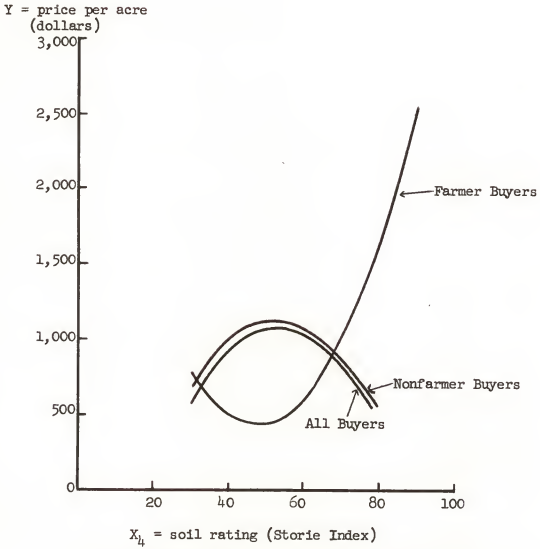
---

1/ The observations were separated into two groups by type of buyer, and separate regressions were derived using the format of equation 1. The coefficients for X_4 in the two equations were significantly different from each other at the .05 level. Similarly, the coefficients for X_4^2 were different at the .05 level. The coefficients for X_4 for farmer buyers and nonfarmer buyers were -113.75 and 107.42, respectively; for X_4^2 they were 1.23 and -1.00. Student's "t" test was used to test the hypothesis that the slope coefficients were equal. The formula is:

$$t = \frac{b_{4f} - b_{4n}}{\sqrt{S_{4f}^2 + S_{4n}^2}}$$

where b_{4f} is the slope coefficient for X_4 (or X_4^2) in the equation for which the sales were to farmer buyers and b_{4n} is the coefficient in the nonfarmer buyer equation. S_{4f} and S_{4n} are the standard errors of b_{4f} and b_{4n}.

Figure 6. -- Expected Relations between Land Price and Soil Rating*



* Using equation 1 and the following values of other variables: $X_1 = 36$, $X_2 = 15$, $X_3 = 3$, $X_5 = 120$, $Z_2 = 1$.

a net return or productivity measure between crops. The line derived for farmer buyers reveals that the Storie index is an indicator of quality, and possibly agricultural net returns, for high values of the index (above 50). The line derived for nonfarmer buyers indicates that they do not consider the index level important. That is, the nonfarmer buyers are not willing to pay higher prices for land with higher soil ratings.

Acres in parcel.--The larger the size of the parcel, everything else being equal, the lower the expected price per acre. The coefficient for X_5 in equation 1 was approximately 1 and the coefficient for X_5^2 was not significantly different from zero. This means that for each acre increase in size of parcel, the expected price per acre fell about $1 per acre. For 120-acre parcels having a soil rating of 60, that sold in December 1959, and were located 15 miles from the city center, 3 miles from a major highway, and in an irrigated pasture area, the expected sales price is $1,025 per acre. For 640-acre parcels of comparable land the expected price is about $500 per acre.

Type of agricultural area.--The observations were grouped by the type of general agricultural area in which the parcels are located, as given in Figure 2. The groupings, Z_1 through Z_5, served as a locational variable, although the coefficients proved to be unreliable estimators. The rangelands (Z_1) and the row crops, rice, and orchard lands (Z_5) are located further away from urban development than are the average parcels, making their net effects on prices below average. The observations that fell in the small grain areas (Z_4) had net effects above the average. These areas are near present urban development. The areas with irrigated pasture (Z_2 and Z_3) are not quite as close to urban development, and thus the net effects were slightly below the average.

Land-use intensity.--As an alternative to the grouping by type of agricultural area, uses of each parcel at the time of sale were recorded and classified into five groups based upon the intensity of land use and agricultural returns to land. These are Z_1' through Z_5'. The expected relationship is that the more intensive the land use, or the better the net returns to the farmer, the higher the sales price. However, none of the coefficients in equation 2 were significantly different from zero, and some of the signs cannot be explained. Apparently when agricultural land is sold for eventual urban use, farmers cannot obtain price premiums commensurable with the agricultural returns to the land. The urban value greatly exceeds the agricultural value for any agricultural usage.

Corner lots.--In the analysis of X_3 it was seen that distance to a major highway was an important variable in explaining land price variation. Parcels along the highway sold at considerably higher prices than those away from the highway. By classifying the observations as to whether the parcel was on an intersection of two roads (Z_6 and Z_7), it was found that a premium was paid for corner lots (equation 3). On the average, with everything else held constant, corner lots sold for over $800 per acre more than parcels not on corners. Corner sites are especially desirable in urban use because of their superior accessibility.

Percentage down payment.--Previously it was pointed out that easy credit conditions and the secondary mortgage market make it possible for land to be sold for a low down payment. It was hypothesized that this could lead to a condition where land and credit were sold as a package, resulting in selling prices higher than prices that would have prevailed if the seller received 100 percent cash. Such seems to be the case in Sacramento County.

Out of the total 223 observations, information on the terms of sale were available for 187. The 187 were classified into two groups: Z_8, for which the percentage down payment was greater than 30 percent and Z_9, for which it was equal to or less than 30 percent. Inquiry into the credit field revealed that 30 percent is often used as a rule of thumb to determine the "safety" of a mortgage.

The results, as given by equation 3, show that when the down payment was greater than 30 percent, the expected sales price, with everything else held constant, was about $258 per acre less than when the down payment was 30 percent or less. This indicates that selling prices can be different than cash prices.

Further testing was done using a subsample of 91 observations for which each of the independent variables listed in Table 1 were not significant in explaining price variation. This subsample was divided into three groups according to the percentage down payment: (1) less than 28 percent, (2) 28 through 30 percent, and (3) greater than 30 percent. The second group was set up to test effects of the deferred capital gains tax on selling price. Sellers receiving less than 30 percent down payment can treat the sale as an installment sale and pay capital gain taxes only on that portion of the selling price received in any tax year. The mean selling prices of the three groups were $1,587, $1,527, and $1,077, respectively. Using the analysis of variance, tests revealed that there is a significant difference between the means, at the .01 level, when all groups are taken together. Between pairs, there is a significant difference between groups 1 and 3, between 2 and 3, but not between 1 and 2. Thus, the terms of sale has an effect on the selling price, but the capital gain deferral provision did not.

Concluding Remarks on the Analysis of Land Prices

The imperfection of land markets can result in prices that do not represent market values. This is especially true in the rural-urban fringe, where there is one more element of uncertainty, namely the conversion time from agricultural to urban use. Lacking is the group action of many buyers and sellers that is necessary to establish prices, and, thus, values based on reasonable expectation of the future.

Not only can prices be different than values, but cash prices can be different from selling prices. Many land-sale transactions include the extension of credit. This results in selling prices that include not only the price of land *per se*, but also the price of credit. Usury laws generally prevent the full price of the credit from being stated on the face of the credit instrument.

In the analysis of sales in Sacramento County it was found that over 50 percent of the total variation in prices could not be explained. Some of this unexplained variation is due to factors pertaining to individual sales that cannot be incorporated into the statistical model; and some, so it seems, is due to unreasonable expectations of future net returns and the timing of future events. This, along with the fact that time was a significant variable in the model, indicates that individual prices cannot be taken for market values.

Some of the variation in selling prices is explained by the credit conditions of sale, which is evidence that selling prices include prices of credit. On the average, in transactions for which the down payment was 30 percent or less, land sold for higher prices than land for which the down payment was greater than 30 percent.

Most of the explained variation was due to the access characteristics of the land parcels. Important measures of access are distance from the

city center, distance from a major highway leading into the city, and whether the parcel is a corner lot.

Results of this analysis indicate that land valuation procedures in the rural-urban fringe must rely on something other than individual selling prices. That is, selling prices of a few parcels of land are not reliable as a basis for valuing land that has not been sold. To obtain values for all land a systematic procedure must be followed that would rule out the extreme elements present in selling prices. One such systematic procedure would be to use regression models, similar to those used in this study.[1/] These would yield the expected prices of land parcels, and the expected price, under certain conditions, could be used as value. Another procedure is discussed briefly in the next section.

TAXES OF AGRICULTURAL LAND

Taxes on real estate are the product of two numbers -- the assessed valuation and the tax rate. For good reason, property owners who feel they are under financial pressure from increasing taxes usually are more concerned with the assessment than the rate. To the taxpayer, assessments often appear easier to change. A discussion with the assessor or a complaint to the County Board of Supervisors might result in specific and speedy relief.

But perhaps as important in explaining the frequent concern with assessments in the rural-urban fringe is the fact that they frequently are changed by what seems to be a disproportionate amount. Such sudden changes can be expected when traditional assessor valuation and

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1/ For arguments in favor of their use see Renshaw, Edward, "Scientific Appraisal," The Tax Journal, Vol. 11, December 1958.

administrative practices are used. Traditional approaches appear to be based upon static concepts of value and on a stable market. Thus, they are inadequate for rapidly growing areas.

Pressure for public revenue is intense in a rapidly growing area. Newly capitalized public services clamor for funds on the one hand, while taxpayers, as a group, effectively resist increases in the tax rate. This pressure combined with the very difficult problem of determining value of farmland in the urban fringe, can mean very high tax charges on land relative to its current earning power. For some of this land the opportunity of "cashing in" on high urban land values may, in fact, be many years away.

The Problem of Determining Value in the Rural-Urban Fringe

In California, as in most other states, the constitution, the laws, and the courts have given the assessor a guide, albeit a nebulous one, to use in determining value. In California the "full-cash value" is what a willing buyer would pay a willing seller when neither is under any unusual pressure either to buy or to sell. The transactions presumably are to be cash transactions and not those involving credit or exchange of property. The assessor has to set up a procedure whereby he can determine value of each and every property. First, he must gather information, and second, he must evaluate this information in the light of the guidelines the courts have provided.[1/]

In years past a common way for assessors to arrive at values for the current year's tax roll was to copy the values in the previous year's

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1/ See California State Board of Equalization, Property Tax Assessment Practices in California, Sacramento, June 1954, pp. 6-8, and 37-45. Also, Constitution of the State of California, Article XI, Section 12 and Article XIII, Section 12; also Ballerino vs. Mason, 83 Cal. 447, 23P 530, 1890, and various annual reports of the State Board of Equalization, such as that for 1960-61, pp. 7-16.

tax roll was to copy the values in the previous year's roll. This is still done in many jurisdictions today. Near the other extreme, assessors gather as much information about the property as possible and apply one or more of the traditional guides to valuation: (1) replacement cost of improvements less normal depreciation, (2) net income to the property capitalized at an appropriate rate, and (3) sales of comparable property. Since value of farmland in the urban fringe is affected by the expected returns of a future use, the first two techniques usually are not considered useful by assessors. In any case, the final test for determining value is some indicator of the market.

Individual sales, however, often are poor indicators of market values. The assessor is hard pressed to see that the prices of sales finally used to value other property meet the tests of full-cash value. Buyers and sellers who are relatives, business associates, or old friends do not necessarily indicate these relationships on public records. Property exchanges and related tie-ins are not necessarily obvious. Credit arrangements, tax advantages, and other financial factors such as the discounting of mortgage paper often is not common knowledge. All information pertinent to the sales may not be made public purely for tax reasons. But perhaps more to the point, there are great variations from time to time and from place to place in prices paid that meet the criteria of full-cash value.

A short time after being sold, a parcel could command a very different price. Information about the market could change. An area where demand has been intense, and willing sellers have been few, is likely to have very different prices than an area where demand is weak, and those willing to sell are many. Reasons for differences between areas may not be obvious or simple. The areas may appear to differ by

no more than direction from the city center. A major piece of detective work, and an intimate knowledge of the factors affecting values, often is necessary to make a sound appraisal in the fringe.

A fundamental problem in assessment is equalization. This means that whatever the standards used to determine property values, they should be the same regardless of the type or location of the property. Market prices, and thus assessments at a constant percentage of market prices, would meet this criterion if the economists' conditions for a perfect market prevailed and if the full cost of credit could be included in the interest rate. In a perfect market, values would be comparable because differences in location and character of the properties would be reflected in the prices. But in actuality, differences in prices also reflect differences in the make-up of the market itself, or in the extent to which market's conditions deviate from perfect. Moreover, differences in prices reflect differences in the amount and type of credit, if any, extended to the buyer. It is not at all clear just how market and credit conditions should be evaluated in assessment work, but it does seem that the concept of "full-cash value" implies some adjustment for differences in the make-up of the market and for credit conditions.

A major reason why land markets differ is the unusual way in which knowledge about the market is shared. The differences in possible future uses can be greater than the present uses and who knows what the future will hold? Owners who bought when the only uses were farm uses are not likely to know very much about possible returns from urban uses. They may sell for too little or hold out for too much. A few buyers may be well versed in future needs for urban land; they may know where sewers will be built, where roads will be improved, and where jobs will be

located. But a common feature on the buying side is speculative fever. Speculation attracts many buyers with poor knowledge of the course of urban development. They jump in when prices spiral upward, pushing them even further up; many are forced out when prices fall, making them fall further. Speculative cycles and the scattered activities of speculators increase the difficulties of using the comparable sales method of valuation in the urban fringe.

A Suggested Procedure for Valuation in the Fringe

It is possible to devise techniques that would tie appraised values directly to market prices, and at the same time minimize the effects of erroneous or extreme influences of individual sale prices. One procedure would be to use regression analysis similar to that used previously. Another way would be to focus attention on a few key sales -- those for which the buyers' purpose clearly was immediate urban development. These sales are most likely to reflect accurately the present value of expected future net returns to the land in urban use. With these sales data as estimates of the value of land that is to be converted immediately to urban use, adjustments could be made for special features of other land parcels in order to obtain their values. A key adjustment would be for differences in the normal or probable time of urban development for the subarea in which a parcel is located. Estimates of the probable time would have to be reviewed regularly with the help of planners and other informed people. Another important adjustment would involve selecting the discount rate to be applied for each year's wait before urban use. After the proper adjustments have been made in the key prices, they would be combined with the present value of future agricultural net returns that would be forthcoming until the land is converted to urban use.

This procedure for obtaining value in the rural-urban fringe was given in equation 1a, page 8. An example of how this procedure is computed is shown in Table 2. The present value of agricultural income is computed by letting A_t = \$50 and r_a = 0.05; and the present value of urban income is computed by letting UV = \$3,000 and r_u = 0.15 in one case and a function of time in the other.[1/] The fringe value is the sum of the two.

Taxes and Urban Sprawl

Rapid urban growth puts intense demands upon public finances for at least three reasons. First, many new governmental services are begun or old ones expanded. And starting new services usually means higher initial costs, as facilities are used at less than capacity, personnel must be trained, and nonbonded capital costs must be met. Even bonding of capital costs can require higher expenditures in new areas than in areas where most capital items partially have been paid off, or where capital items were built during times of lower prices. Second, urban growth in former agricultural areas often will mean public services at higher levels, both in terms of quality and kind. Some property owners will receive little or no benefit from these services, but will pay higher taxes because of tremendous increases in their property values and, to a lesser extent, increases in their tax rate. Third, urban sprawl usually leads to less efficient patterns of urban activity.[2/] This is reflected by higher costs of providing public

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1/ Because of the greater risk involved in land investments in the rural-urban fringe, r_u was made larger than r_a.

2/ For an estimate that puts the national annual loss at \$5 billion see Scheckter, Henry B., "Cost-Push of Urban Growth," Land Economics, Vol. 37, No. 1, February 1961, p. 18. Also see Meyer, Charles W., "Urban Growth Patterns and the Cost of Local Telephone Service," Land Economics, Vol. 38, No. 3, August 1962, p. 273. For a review of some gains from sprawl, see Lessinger, Jack, "The Case for Scatteration," Journal of the American Institute of Planners, August 1962.

TABLE 2

Illustration of a Procedure to Estimate the Value of Land in the Rural-Urban Fringe a/

Additional years land will be used for agriculture (k)	Method with $r_u = 0.15$: Present value of agricultural income, $A_t = 50$, $r_a = 0.05$	Method with $r_u = 0.15$: Present value of urban income UV = 3,000	Method with $r_u = 0.15$: "Fringe" value	Method with r_u increasing with time b/: Present value of urban income UV = 3,000	Method with r_u increasing with time b/: "Fringe" value
	$\sum_{t=1}^{k} \frac{A_t}{(1 + r_a)^t}$	$\frac{UV}{(1 + r_u)^{k+1}}$	FV	$\frac{UV}{(1 + r_u)^{k+1}}$	FV
1	2	3	4(2+3)	5	6(2+5)
1	48	2,222	2,270	2,714	2,762
2	93	1,913	2,006	2,582	2,675
3	136	1,646	1,782	2,456	2,592
4	177	1,417	1,594	2,336	2,513
5	216	1,220	1,436	2,222	2,438
6	253	1,050	1,303	1,971	2,224
7	288	904	1,192	1,714	2,002
8	322	778	1,100	1,460	1,782
9	354	669	1,023	1,220	1,574
10	384	576	960	999	1,383
11	413	496	909	801	1,214
12	440	427	867	630	1,070
13	466	368	834	486	952
14	491	316	807	368	859
15	515	272	787	272	787

a/ See equation 1a, page 8.

b/ $r_u = 0.05$ when $k \leq 5$

$r_u = 0.05 + 0.01(k-5)$ when $k > 5$.

services such as water, streets, sewers, and police and fire protection.

When new residences are built, their location should be of interest to the taxpayer. If a given number of new houses in a tax area can be served easily by existing under-utilized governmental facilities there actually could be a reduction in the tax burden of present taxpayers. But in certain locations new public facilities must be provided, which could mean a substantial increase in tax burdens.

No studies for Sacramento, or other California locations, have been found that attempt to show marginal costs of governmental services resulting from new residences. A study was conducted in Massachusetts, however.[1/] Immediate capital outlays for schools, streets, sewers, water, and fire services associated with 500 new dwellings were $1,900 to $2,800 per dwelling unit. About half of these capital outlays were borne by the municipality and the balance by the builder. Operating and maintenance costs of the services ranged from $150 to $500 per dwelling.

The impact of new urban development on existing individual taxpayers depends upon the size of the tax jurisdiction that provides each service. One extreme would be to have all new services provided for by a new tax jurisdiction which would include only the new dwelling units and no other property. At the other extreme would be a large city which would finance the new development from a very broad tax base. Also, the type of tax revenues used would have an effect on tax burdens. Here the property tax and the federal grant represent extremes. Obviously, actual situations fall in between.

1/ Wheaton, William L. C., and Morton J. Schussheim, The Cost of Municipal Services in Residential Areas, U. S. Department of Commerce, Housing and Home Finance Agency, Washington, D. C., 1955. Costs are expressed in 1951 dollars. For a study using hypothetical data see Isard, Walter, and Robert E. Coughlin, "Municipal Costs and Revenues Resulting from Community Growth," Journal of the American Institute of Planners, Vol. 22, 1956; Part I in the Summer issue and Part II in the Fall issue.

The way in which governmental service costs to newly developed areas are shared between the new homeowners and other taxpayers is never very clear. It is a rare thing to have the taxes obtained from an individual equal the governmental expenditures needed to serve that individual. This is not to imply that all property taxes should be adjusted to conform to direct benefits received, but rather to emphasize that new urban developments located far from existing urban facilities may not bear the full cost of extending urban services to them. The developer often does not need to consider the relative impact of 100 more school children. Yet, the effect may be quite different for a rural school district than for a city district. In his choice of location, the developer often does not need to consider the fact that the main road to town may need to be rebuilt as a result of his subdivision, or that new fire-fighting facilities, police protection, storm drains, or a hundred other things will be needed.

There are two factors at work here. First, these costs are not all borne by the property to be developed and, thus, do not enter into the private decision as to whether or not to develop it. Second, there tend to be problems that come to a head well into the future. The first subdivision of 15 houses 6 miles from town may not affect any of these things very much; the second and third may not either. But, eventually, the clamor of dissatisfied urban citizens living in the rural fringe cannot be ignored.[1/]

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1/ For a discussion which argues that public facilities should be developed ahead of need in order to encourage efficient patterns of urban growth, thereby reducing the cost to the eventual urban user, see Lessinger, Jack, "Is the Supply of Urban Land Running Out?" Reprinted from The California Managment Review, Spring 1961, Real Estate Research Program, Institute of Business and Economic Research, University of California, Berkeley.

The Real Estate Tax Base in Sacramento County

Total assessed valuation of taxable property, less exceptions, in Sacramento County rose 127.1 percent from 1949-50 to 1959-60, while the county tax rate in unincorporated areas rose 26.2 percent (Table 3). The tax rates of other jurisdictions, particularly school districts, had larger increases on the average. But assessed valuation alone increased between the census years more rapidly than did population. (Population changed 81.4 percent.) Since 1959-60 net assessed valuation has climbed even more rapidly, increasing 56.1 percent in three years. The county tax rate has declined slightly, however.

The very rapid rise in assessments since 1959-60 is due partly to an energetic reassessment program and partly to changes in the assessment ratio (assessed value divided by appraised market value). In 1960 the State Board of Equalization began reporting estimates of the assessment ratio for the various counties. It continued to press for the equalization of county ratios at the 25 percent level. In 1960-61 the reported average assessment ratio for Sacramento County was low at 20.2 percent; it rose to 23.3 percent in 1961-62 and to 25.8 percent in 1962-63.[1/] Between the years 1960-61 and 1962-63, 88.8 percent of the 224 million dollar increase in assessed valuation was due to the increase in the assessment ratio and the remainder was due to a rise in the market value of property. There can be no doubt, however, that most of the increase in assessed value since 1949 was due to new market values of both new and old property.

It is probable that in the earlier years the assessment ratio fell from year to year, since assessments were not always adjusted as values

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1/ Annual Reports of Financial Transactions Concerning Counties of California, Fiscal Years 1959-60, 1960-61, and 1961-62, State Controller.

TABLE 3

Assessed Valuation of Property Subject to Tax, and County Tax Rates, Sacramento County, 1949-50 to 1962-63

Fiscal year	Net valuation	County tax rates a/	
		Inside	Outside
	million dollars	dollars per $100	
1949-50	258	1.89	2.14
1950-51	270	2.10	2.35
1951-52	300	2.10	2.37
1952-53	334	2.16	2.47
1953-54	356	2.45	2.72
1954-55	370	2.83	3.14
1955-56	394	3.06	3.31
1956-57	458	2.33	2.64
1957-58	496	2.33	2.65
1958-59	525	2.44	2.76
1959-60	586	2.32	2.70
1960-61	691	2.27	2.70
1961-62	835	2.35	2.64
1962-63	915	2.26	2.55

a/ Inside tax rates refer to the rate inside incorporated cities. Outside refers to unincorporated areas.

Source: Various Annual Reports of Assessed Valuation and Tax Rates of the Counties of California, State Controller.

in the market rose. New improvements -- houses, stores, factories -- could not be ignored, which undoubtedly had the effect of shifting tax burdens from those who had not made any property improvements to those who had.

Between 1949 and 1959, according to the Census of Agriculture, the value of farm real estate rose from $116 million to $221 million in Sacramento County. The assessed valuation of the county rose during this same period from $258 million to $525 million -- a slightly larger proportionate increase. This looks like farm real estate as a proportion of the total real estate tax base fell slightly. However, this implication does not necessarily hold true if the assessment ratio for farm real estate changed relative to that for nonfarm real estate. Unfortunately, no information is available as to how ratios for farm real estate compared to those for nonfarm real estate.

Assessments and Taxes by Subareas

In addition to the lack of information on assessment ratios of farm real estate, there is lack of information on the total farm assessments and taxes. This is because it is impractical to separate the farm assessments and taxes from the overall county assessments and taxes. Insight, however, can be obtained by examining data from a sample of farms.

A sample of 82 parcels of farmland (8,564 acres) was selected from the county's tax roll in a manner to insure a geographical distribution throughout the main agricultural areas. Data on taxes, assessments, acres, and land use were collected for the parcels. Ownership of the parcels did not change in the 1958-61 period. The assessed value of the property improvements was separated from the total assessed value, leaving data for taxes and assessments that applied only to land.

In 1960 the average tax levied per acre was $6.89 and the average assessed value per acre was $98.95. The variation of these data is large. Taxes per acre were as high as $52.58 and as low as $0.56; and the range for assessments per acre was $8.71 to $814.64.

Figures 7 and 8 show the average taxes and assessments, respectively, in the geographical subareas referred to previously along with a measure of variability.[1/] Some of the variation in taxes and assessments is associated with the location of the parcels in relation to the urban center.

Assessments and taxes were highest in the Sacramento subarea, where most of the farming in 1960 was in the southern part near the Sacramento River. Next was the Elk Grove subarea where most of the speculative land-sale activity took place during the 1958-61 period. Variability in taxes per acre was largest in the Elk Grove subarea (191 percent), which is consistent with the speculation. The greatest variability in assessments per acre was in the Natomas subarea. The variability in taxes is different from the variability in assessments because of variation in tax rates. A comparison of the figures in the Delta, Galt, and Clay subareas reveals the relative ability of the agricultural land to produce revenue since these subareas are relatively free from the influence of urban activity.

Assessments and Prices

In a perfect market situation prices and values would be synonymous, and if appraisals for tax purposes were kept up to date, the ratios of assessments to appraised values. An examination of the assessments

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1/ The variability coefficients are the standard deviation divided by the mean times 100.

Figure 7. -- Average Taxes per Acre of Farmland and Variability Coefficients by Subarea, 1960

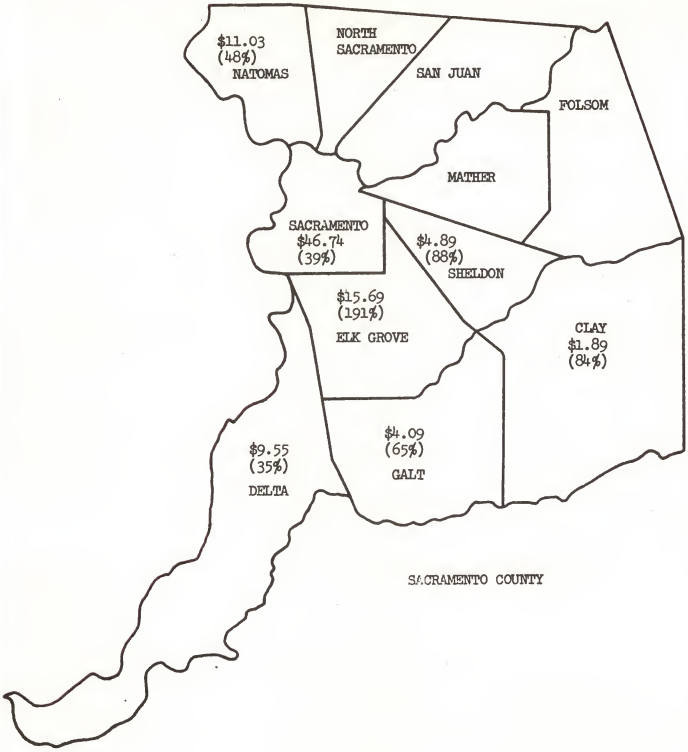
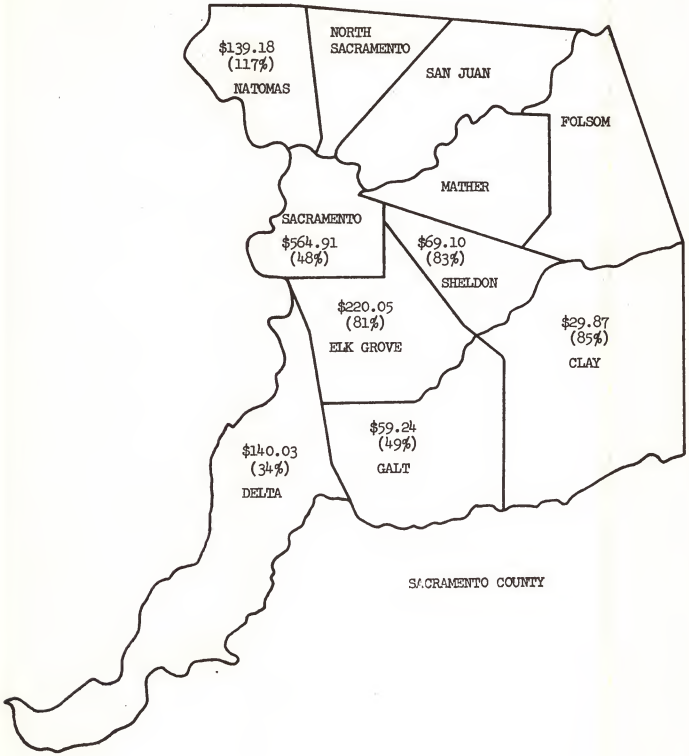


Figure 8. -- Average Assessments per Acre of Farmland and Variability Coefficients by Subarea, 1960



should give some indication of the extent to which appraised values are related to prices and to what extent assessments are kept up to date with changes in prices. This examination will involve the use of regression equations similar to those used previously. The assessed value per acre was recorded for the 223 parcels in the land-sale sample described previously. The assessed values were those on the property prior to the sale and had not changed in recent years. These values were substituted in equations 1 and 2 (Table 1) for the dependent variable, sales price per acre. The new equations, 1a and 2a, are given in Table 4. A comparison of the coefficients and standard errors in Table 4 with those in Table 1 reveals that the independent variables were less reliable in explaining assessments than they were in explaining prices.

Failure of the assessments to change with market conditions or failure of individual prices to act as guides to changes in appraised values can explain the discrepancy between the equations. Land market conditions change rapidly for land situated near a rapidly growing urban center and, as was indicated previously, individual prices in the fringe area often do not reflect market values. Expected prices derived from a regression equation, however, can be considered "average" values and therefore should represent values more closely than individual prices. Accordingly, the ratio of expected assessed values to expected sales prices (assessment-price ratio) derived from the equations for certain values of the independent variables should yield some indication of how the assessment ratios vary.

Figure 9 shows how the assessment-price ratio varies with X_1, X_2, and X_3, the three variables that measure urban influences on land prices. The ratio is derived from equations 2 and 2a, with the average values of the independent variables (except the one being varied) entered

TABLE 4

Coefficients of the Regression Equations Used to Explain Variation in the Assessment per Acre in Sacramento County a/

Equation number	Coefficient of determination R^2	Constant term	Date of sale X_1	Distance from center of city X_2	Distance from center of city X_2^2	Distance from highway X_3	Distance from highway X_3^2	Soil rating (Storie Index) X_4	Soil rating (Storie Index) X_4^2	Number of acres in parcel X_5	Number of acres in parcel X_5^2
1a	.21	723.68	.230 b/ (3.261)	-44.83 b/ (37.09)	.76 b/ (1.11)	-57.37 c/ (35.06)	4.35 b/ (4.19)	4.87 b/ (22.02)	-.023 b/ (.226)	-.42 (.23)	.00010 b/ (.00012)
2a	.20	758.03	.011 b/ (3.247)	-62.84 (32.78)	1.22 b/ (.99)	-75.93 (33.31)	6.43 c/ (3.99)	12.27 b/ (21.51)	-.108 b/ (.217)	-.24 (.11)	--

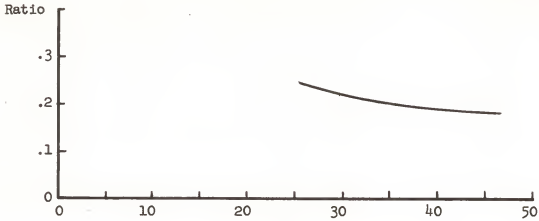
Equation number	Type of general agricultural area in which parcel is located: Range Z_1	Irrigated pasture Z_2	Mixed Z_3	Grain Z_4	Row crops Z_5	Land-use intensity of parcel at time of sale: Vacant Z'_1	Dry pasture Z'_2	Irrigated pasture Z'_3	Fruits and vegetables Z'_4	Rural homesites Z'_5
1a	[-95.30]	-31.77 b/ (30.45)	-20.84 b/ (50.76)	108.06 c/ (70.60)	60.41 b/ (75.82)					
2a						47.22 b/ (37.23)	23.59 b/ (50.93)	-35.40 b/ (35.89)	-45.53 b/ (107.14)	[-84.11]

a/ Numbers in parentheses under the coefficients are the standard errors. The dummy variable coefficients in brackets were not computed as part of the equation, but are interpreted in the same way.

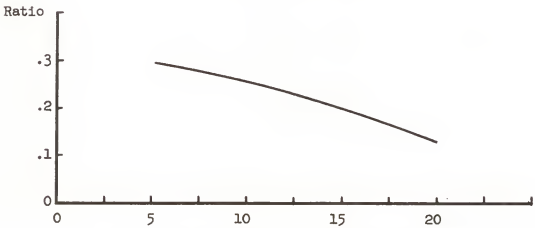
b/ Not significant at the 0.10 level.

c/ Significant at 0.10 level, but not significant at the 0.05 level.

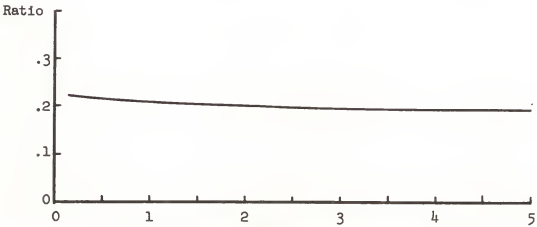
Figure 9. -- The Ratio of Assessment per Acre to Land Price per Acre Compared to Time of Sale and Location of Parcel



X_1 = month of sale (25 = January 1959)



X_3 = miles from center of the City of Sacramento



X_4 = miles from a major highway leading to the City of Sacramento

into the equations. The ratio declined over time, which is consistent with the fact that prices went up and assessments were stable during the time period of the sample. The ratio also declined with distance from the City of Sacramento. The assessment of property relative to its price was low for property located some distance from the city compared to property near the city. There was not much change in the ratio when related to distance from a major highway.

From equations 2 and 2a the average expected assessment-price ratio also can be obtained on parcels grouped by land use. These are:

Land use	Ratio
Vacant	.26
Range	.19
Irrigated pasture	.20
Row crops, rice, and orchards	.17

Tax Comparisons with Other Counties

Table 5 gives an indication of how taxes on farmland in Sacramento County compare with those in other counties in the state. Sacramento County is a standard metropolitan statistical area (SMSA) as defined by the census. There are ten such areas in California. These encompass 17 counties, including such widely different ones as San Bernardino, Kern, Fresno, and Los Angeles. The average tax per acre in California's SMSAs was $6.36 in 1959 and $7.21 in 1960. This compares to $7.44 and $7.76, respectively, for the sample in Sacramento County. While taxes went up $0.85 an acre, or 13.4 percent, in all SMSAs they rose $0.32, or 4.3 percent, in Sacramento.

Taxes per acre were lower in counties adjacent to the SMSAs and in rural counties than they were in the SMSAs. It is probable that

TABLE 5

Taxes Levied per Acre on Farm Real Estate on Sample Farms by Type of County, State of California, 1959 and 1960

Type of county	Number of farms in sample	Acreage in sample	Tax per acre		Percent change
			1959	1960	
			dollars		
Standard metropolitan statistical areas a/	267	41,844	6.36	7.21	13.4
Counties adjacent to standard metropolitan statistical areas a/	346	103,617	2.69	3.12	16.0
Rural counties a/	151	52,473	1.90	2.03	6.8
TOTAL a/	764	197,934	3.26	3.69	13.2
Sacramento County b/	82	8,564	7.44	7.76	4.3

a/ Source: Farm Economics Division, Economic Research Service, U. S. Department of Agriculture.

b/ Source: Sample drawn by authors from the tax role. The Sacramento taxes per acre are not directly comparable since the other figures do not include taxes levied for special assessments, such as for drainage, irrigation, and weed control.

this not only reflects differences in urbanization but also reflects differences in agriculture as well. Urban counties tend to have a disproportionate amount of the more productive soils of the state. Also, the intensity of land use is probably higher, even for comparable quality of soil. This would give higher farm property values for the counties classified as more urban, even where direct urban effects on value have not yet been experienced.

Taxes Related to Net Returns and Rents

In order to put into perspective some of the effects of urbanization, net returns to real estate and management were computed from available cost and revenue data for some of the major agricultural enterprises. County averages, as reported by the Agricultural Commissioners, were the basis for revenue estimates. Cost data sheets prepared by the Agricultural Extension Service of the University of California were relied upon for cost estimates (see Appendix). The cost information was obtained in consultation with groups of progressive farmers who tend to be specialists. Even though the latest survey data are utilized as a check, and the intent is to derive typical figures, it seems plausible that the strict arithmetic mean of the costs of all farmers in the county well may be higher than these estimates. This means that the net returns presented here may be above the average in the county. Also, it must be pointed out that prices received, physical conditions, technology used, and levels of management vary considerably from farm to farm.

The net return estimates are presented in Table 6. They give an indication of the general order of magnitude of net returns from the prevailing agricultural uses of land, and some indication of the amount

TABLE 6

Net Returns to Land and Management per Acre from Selected Agricultural Enterprises in Sacramento County, California, 1960 and 1961

Enterprise	Per acre residual
	dollars
Pears 15 tons per acre at $84 per ton, 30-acre unit	427
Hops 1,558 pounds per acre at $0.57 per pound, 90-acre unit	15
Rice 53 hundredweight per acre at $4.25 per hundredweight, water at $3.00 per acre-foot	96
Dairy farm 80 acres of irrigated pasture, 75-cow herd, 60 percent Class I utilization	38
Range Production of 18-month steers with Sacramento winter range	2

Source: Based upon data presented in cost data sheets prepared by the Agricultural Extension Service, University of California, (details are in the Appendix).

of current income that is available to pay taxes, reward the operator for his managerial effort and risk taking, and to meet payments on his land indebtedness. Thus, the net returns are not "pure" residual return to land, but they are the residuals often used in land valuation procedures. A "pure" residual is impossible to obtain, since returns to management would have to be imputed in an arbitrary way.

In addition to the computation of residuals to land and management, typical rental rates obtained by the Agricultural Extension Service are presented in Table 7. The rents are only roughly comparable to the net return residuals computed. In the typical rental agreements the landlord supplies the land and its improvements and pays for major repairs to the improvements. Thus, the rent for the most part is a return for investments made by the landlord. The tenant, on the other hand, supplies the management and pays all current expenses. His return after paying the rent represents returns to management. Since the net return residuals shown in Table 6 include both returns to management and land they should be higher than the rents.

The rental data take on more significance if it is realized that usually only a portion of the acreage of a farm will be in any one crop. A typical rotation system and percentages of land in various uses for two farm sizes are presented in Table 8, along with estimates of the per acre rental for the whole farm unit. Weighted averages indicate rents for farm units on the order of $50 to $60 per acre. It is probable that this estimate does not reflect adequately the wasteland, land used for farmsteads, and the like found on most farms. Also, these proportions devoted to various crops for the county as a whole differ from those used in Table 8. More of the crops that use land less intensively are found countywide. Vegetables occupy less than 10 percent of the

TABLE 7

Rents for Selected Land Uses, Sacramento County, 1960-61

Crop	Yield	Price	Share	Rent
		dollars	percent	dollars
Tomatoes (tons)	16.4	30.00	20	98.40
Alfalfa (tons)	7.0	19.00	33	44.29
Ladino clover seed	--	--	a/	35.00
Sudan seed	--	--	a/	35.00
Wheat (tons)	1.1	62.00	25	17.05
Barley (tons)	1.0	40.00	25	10.00
Rice (cwt)	50.0	4.50	33	75.00
Milo (cwt)	50.0	2.25	25	28.12
Sugar beets (tons)	20.0	12.70	20	50.80

a/ Cash rents rather than share rents were reported.

Source: Based upon data prepared by the Agricultural Extension Service, University of California.

TABLE 8

Estimations of Rents for Whole Farm Units Based Upon a Typical Cropping Pattern

Crop	160 to 320 acres		320 to 640 acres	
	Percent of land[a]	Approximate rent per acre[b]	Percent of land[a]	Approximate rent per acre[b]
		dollars		dollars
Alfalfa	15	44.00	20	44.00
Barley	10	10.00	20	10.00
Milo	15	28.00	15	28.00
Sugar beets	20	51.00	15	51.00
Tomatoes	40	98.00	30	98.00
Weighted average per acre		61.00		52.00

a/ Source: Dean, Gerald W., and Harold O. Carter, Cost-Size Relationships for Cash Crop Farms in Yolo County, California, University of California, Giannini Foundation Mimeographed Report No. 238 (Berkeley, 1960), p. 24.

b/ Source: Table 7.

cropland, and lower-value crops such as barley, wheat, grain for hay, and oats occupy almost a third of all cropland. Using the cropping pattern for the county and a procedure similar to that used in Table 8, average rents of $34-$38 per acre were computed for cropland.

In Table 9 the data on rents and net returns are grouped by intensity of land use so that they can be compared with taxes paid. Land in the most intensive use, such as in mature, high-value orchard crops, yields several hundred dollars per acre that can be made available to pay for the costs of holding land. Owners of these lands would have the greatest ability to hold out in the face of urban encroachment. A few specialized crops still representing high intensity of land use, such as rice and tomatoes, have around $100 available per acre. In some instances, dairying, where a high fluid utilization contract can be said to be sold with the land, would fit into this classification. Crop farming and most milk-producing units taken as systems of farming have around $50 per acre. Land which is only suitable for dry range is at the bottom of the scale at less than $5.00, but this low intensity class is given a slightly wider range to account for those units where range and small grains or irrigated pasture are combined.

Conclusions drawn from the relationship between taxes and net returns must be considered as tentative since the variation of taxes paid within each land use classification is quite high. It appears, however, that low-intensity uses carry a very high tax burden relative to current returns. The taxes do not rise in the same proportion as net returns, creating lower tax burdens for farms with high-valued crops.

Concluding Remarks on the Analysis of Property Taxes

Land valuation is extremely difficult in the rural-urban fringe. Estimates of future returns to land often are more uncertain in the

TABLE 9

Sample Tax Data Compared with the Range of Net Return Residuals to Land and Management and Gross Rental Returns for Land Use Intensity Groups

Land use intensity groups	Range of residuals and rentals per acre	Average 1960 property taxes per acre	
		Properties sampled from tax roll a/	Sample of rural properties sold b/
	dollars		
Highest intensity Pears and other fruit	120-425	8.36	32.34
High intensity Rice, some dairying, and some vegetables	80-120		
Medium intensity Row crops, dairying, and some small grains	40- 60	8.24	23.30
Low intensity Range and some small grains	2- 15	7.03	16.93
Overall weighted average	25- 30	7.56	22.05

a/ Taxes on land only.

b/ Taxes on land and improvements.

fringe than in other areas because of the uncertainty of the conversion time of the land from rural to urban use. Individual prices can be poor guides to value. The uncertainties of the fringe make it essential that land valuation for tax purposes be systematic and equitable, based on realistic expectations of future events.

The lack of systematic valuation procedures, and the failure to revalue frequently, have effects on tax burdens. Tax burdens also can be affected by the growth in the number of residences. On one hand, new homeowners may not pay the full cost of additional public services needed to serve them, creating excessive tax burdens for the existing homeowners. On the other hand, new residences in an area may bring added services to the older residences, and failure to revalue the latter may mean excessive burdens for the former.

In Sacramento County, most of the property has been revalued in recent years, and the assessed value has been made more uniform in relation to the appraised value. Much of the increase in total assessed value for the county in the fiscal years 1960 to 1962 resulted from increasing the assessment ratio to 25 percent. The assessed values used in this report for the sample data were those that existed before the wholesale revisions took place. The sample data revealed that land assessments per acre were generally higher in areas near the City of Sacramento than in areas some distance away. This relationship would be expected since land near the city generally has a higher probability of being converted to urban use in a given time period. Distance from the city plays an important role in determining the time a given parcel of land will be converted, and thus has a direct relation to the value of the parcel. The data also revealed that land assessments per acre had a greater variability from parcel to parcel within the fringe acres

near the city than in more distant areas. Individual land prices also have this greater variability in fringe. A systematic valuation procedure could reduce the variability in assessments.

When the assessments were related to prices it was found that, on the average, assessments failed to keep up with the price increases over time, thus, for given tax rates, appearing to reduce the tax burden on land without recent improvements. The assessment-price ratio declined with distance from the city and with distance from the highway leading into the city. This behavior indicates that tax burdens on property away from the urban activity may have been less than the burdens on property near the urban activity.

Taxes per acre varied in the same way as assessments per acre. In fringe areas close to the city they were higher and had greater variability than in more distant areas. It appeared that taxes were not strongly related to the net agricultural returns to the land. Taxes as a proportion of the net returns was lower on land yielding high net returns than on land yielding low returns.

APPENDIX

APPENDIX TABLE 1

Estimated Returns to Land and Management per Acre in the Production of Pears, Hops, and Rice, Sacramento County, 1960

	Pears, 30-acre unit	Hops, 90-acre unit	Rice, no size indicated
	per acre		
Yield	14.87 tons	1,558 lbs.	53 cwt.
Price	$ 84.31	$ 0.57	$ 4.25
Receipts	1,253.69	888.06	225.24
Labor and field power	557.97	455.84	24.40
Materials	110.08	152.00	74.10
Depreciation	62.35	122.10	16.60
Interest on equipment	9.78	20.37	3.60
Other overhead (except land taxes)	87.00	122.93	10.70
TOTAL EXPENSES[a/]	827.18	873.24	129.40
Residual to land and management	426.51	14.82	95.84

a/ Depreciation and overhead include expenses necessary to maintain real estate improvements in working order, but other costs of real estate such as interest have not been included.

Source: Yields, prices, and receipts are from Sacramento County Agricultural Commissioner's Reports. Expenses were derived from enterprise cost data sheets prepared by the Agricultural Extension Service, University of California.

APPENDIX TABLE 2

Estimated Returns to Land and Management per Acre in the Production of Grade A Fluid Milk, Sacramento County, 1960

(85-acre farm with 80 acres of irrigated pasture and 75 cows)

Milk enterprise (60 percent Class I utilization contract)

Milk sales	$36,624		
Stock sales	2,932		
Total receipts		$39,556	
Feed purchases	12,446		
Replacement cows	4,750		
Labor	8,640		
Miscellaneous (except land taxes)	7,374		
Depreciation	1,975		
Interest	1,125		
Irrigated pasture expenses a/	4,643		
Total expenses		36,310	
Residual to land and management		3,246	
Per acre residual (85 acres)			$38.19

a/ Per acre expenses are:

Labor and field power	24.15
Materials	7.00
Depreciation	18.65
Interest on equipment	1.44
Other overhead	6.80

Source: Enterprise Cost Data Sheet prepared by the Agricultural Extension Service, University of California

APPENDIX TABLE 3

Estimated Returns to Land and Management per Acre in the Production of 18-Month Steers Utilizing Winter Range in Sacramento County, 1960

Beef enterprise			
Sale of 323 steers and heifers	$53,371		
Sale of 85 bulls and cows	14,940		
Total receipts		$78,311	
Feed (other than winter range)	13,468		
Labor	10,860		
Miscellaneous (except land taxes)	1,630		
Machinery	11,480		
Building maintenance	593		
Interest on livestock	9,380		
Bull replacement	1,750		
Winter range expense a/	3,315		
Total expenses		52,476	
Residual to land and management		25,835	
Per acre residual (11,050 acres)			$2.34

a/ Winter range is expected to provide some 6,630 animal unit months of feed for an enterprise of this size. At 10 acres per animal unit for 6 months this is 0.6 animal units per acre, implying some 11,050 acres would be required. Fence repair and other overhead expenses are estimated at $0.30 per acre.

Source: Weeks, David, The Long-Term Outlook for the El Dorado County Livestock Industry, El Dorado County Department of Planning, Placerville; and Enterprise Cost Data Sheets prepared by the Agricultural Extension Service, University of California.